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Recent Publications

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WARWICK & YORK, Inc.

THE PSYCHOLOGY OF DRAWING

By Fred C. Ayer

172 pages; $1.25

The laboratory method has come to be practically universal in the teaching of science. The process of drawing is everywhere esteemed as a most significant form of laboratory methodology. To some degree in the physical sciences, but more especially in the biological sciences, the amount of time devoted to making pen and pencil drawings is a major part of the laboratory procedure. Many pupils encounter great difficulty in making the required drawings. They either make poor drawings or consume a disproportionate amount of time in the effort to make good ones. Because of this, many receive low grades, are discouraged, and discontinue their work in the field of science. The widespread use of a teaching device which consumes extended periods of time in all cases, and fails to meet the needs of individual pupil in many cases, raises an important problem. Laboratory work has three aims: the observation of material, the making of records, and the retention of learning. It furthers these aims by three devices: representative drawing, description, and analytical drawing. In the "Psychology of Drawing," Dr. Ayer undertakes to determine the character of the various interrelations of the factors which enter into laboratory procedure. The text includes a survey of the existing literature of the psychology of drawing. An attempt is made to charaterise the chief contributions to the psychology of drawing and to organise the results of the important studies in such a manner as to afford students of the various aesthetic, economic, and scientific aspects of drawing a scientific point of departure.

THE EXPERIMENTAL DETERMINATION OF MENTAL DISCIPLINE IN SCHOOL STUDIES

By Harold O. Rugg

160 pages, $1.25

The problem of mental discipline, of determining under what conditions, by what methods and to what extent training received in a given line of mental activity spreads to other lines of mental activity, is acknowledged to be the central problem of educational psychology. The answer that experimental investigation affords to this problem is acknowledged to possess a most significant bearing upon several cardinal problems in education. The arrangement of the curriculum, particularly in the high school, the designation of prescribed courses in both high school and college, the selection of methods of instruction in various subjects—all these things depend in part upon what we know about the nature of mental discipline.

Dr. Rugg's monograph claims attention for two reasons especially: (1) it presents in a compact semi-tabular form a valuable and comprehensive summary of all the experimental work that has been done upon formal discipline to date; (2) it presents the results of the author's own investigation, which is conspicuous because it deals with a large number of subjects (students in the University of Illinois) and because it measured the effect upon mental efficiency produced by a course of instruction (descriptive geometry) carried on under regular classroom conditions. The demonstration of a certain degree of transfer of training is of real importance both in theory and practice.

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THE JOURNAL OF EDUCATIONAL PSYCHOLOGY

A STUDY OF THE ATTAINMENTS OF PUPILS IN UNITED STATES HISTORY

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The study of the ability of pupils in history might be undertaken from several different points of view. We might, first, endeavor to determine the ability to understand present events in the light of the past. This conception of historical ability is one that is frequently proposed in the discussion of the aims of studying history, but it is so vague, so ill-defined that it would be difficult to subject to scientific examination.

In the second place, a more intelligible and scientifically acceptable use of the term historical ability is skill in sifting and evaluating a mass of miscellaneous materials, such as newspaper stories, contemporary documents, hearsay reports, partisan attacks, and special pleadings, and constructing from this confused tangle a straightforward and probable account of a series of events in their causal and consequential relationships. It is this type of ability which is the goal of modern historical scholarship, and its cultivation is striven for by many able and earnest college teachers of history. The extent to which such ability can be developed, and the processes whereby this development takes place, would constitute highly interesting objects of experimental investigation.

Third, a much more modest conception of historical ability is that shown in the appreciation and comprehension of a simple historical narrative, with such an understanding of the interplay of forces depicted in it that a lively realization of the probable

outcome of the series of events would be aroused in the pupil's mind. This is the dominating idea in Kelley's test of historical ability,[1] in which he presents some paragraphs from an account of the unification of Italy, and asks the pupil, first, to tell what was probably the next important event, second, to describe the character and appearance of the hero of the passage, and third, to give as detailed an account of the story as possible.

Fourth, historical ability may be evinced by reflective and discriminating replies to "thought questions" on a given historical situation. This type of test has been used by Buckingham[2] in his study of the connection between ability to think and ability to remember. The thought questions were based on a brief quotation, a series of statements regarding historical facts, or a series of reasons alleged for the truth of a given statement, and the task confronting the pupils was to answer questions propounded in regard to the passage, to rank the events in the order of their importance, or to indicate by a check mark the reasons which the pupils considered cogent.

In the fifth place, history ability may be taken as the readiness with which pupils answer questions revealing the range of their historical information. This is perhaps the narrowest, and in the estimation of some writers, the least important type of historical ability, but it is the one which is the most readily tested, and was, therefore, chosen for study in the present investigation. Moreover, from the report of Buckingham, just quoted, it would appear that readiness of historical information is rather highly correlated with historical reflection and appreciation, as revealed by the answers to "thought questions." The regression coefficient of such historical "information questions" on "thought questions" was .89. It may be assumed, therefore, with a high degree of justification, that ability is responding to tests of historical facts is a fair index of general historical ability. The general problem of the present inquiry was, "What will a carefully constructed information test in United States history reveal regarding individual, sex, and school differences."

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[1] TRUMAN L. KELLEY. *Educational Guidance. An Experimental Study in the Analysis and Prediction of Ability of High School Pupils.* Teachers College, Columbia University, Contributions to Education, No. 71. 1914, page 33.

[2] B. R. BUCKINGHAM. *Correlation Between Ability to Think and Ability to Remember, with Special Reference to United States History.* School and Society, Volume 5, 1917. Pp. 443–449.

The Questions

In selecting the questions for such a historical information test it would be desirable to have the opinions of a large number of competent judges, as high school teachers of United States history, on the relative rank in importance of the data which are included in the teaching of this subject. To secure this ranking would require an extended investigation on its own account, and in the absence of any objective basis the authors, in choosing questions for the present study, were obliged to rely upon their own opinions, supplemented by the advice of several high school and college teachers of history. They endeavored to secure questions that would range from easy to difficult, that would touch upon as many different phases of history teaching as possible, that could be answered briefly, that would afford answers easily scored as right or wrong, and that could be attempted by all pupils in the thirty-minute period ordinarily given to history in the elementary schools, or the forty-minute period of the high schools. After extended discussion and experimentation the following groups of questions were decided upon: I. Give the reason for the historic importance of each of ten representative dates (Dates-Events). II. Indicate for what each of ten prominent men was celebrated (Men-Events). III. Mention the name of the man prominently connected with each of ten historic events (Events-Men). IV. Define in a short sentence each of ten historic terms (Historic Terms). V. Make a list of all the political parties that have arisen in the United States since the Revolution, and state one principle advocated by each (Political Parties). VI. Indicate the great divisions or epochs of United States history (Divisions of History). VII. On an outline map of the United States (supplied) draw the land boundaries of the United States at the close of the Revolution, and indicate the different acquisitions of territory since that date (Map-Study). The questions were as follows:

I. Dates-Events. (Four minutes)

1. 1861.
2. 1789.
3. 1620.
4. 1565.
5. 1898.
6. 1619.
7. 1783.
8. 1492.
9. 1776.
10. 1846.

II. Men-Events. (Five minutes)

1. John Burgoyne.
2. Alexander Hamilton.
3. Jefferson Davis.
4. Walter Raleigh.
5. John C. Calhoun.
6. Cyrus H. McCormick.
7. George Dewey.
8. Sam Houston.
9. Roger Williams.
10. James Oglethorpe.

III. Events-Men. (Three minutes)

1. Captured Quebec during French and Indian War.
2. Discovered the North Pole.
3. Wrote the Declaration of Independence.
4. Invented the telephone.
5. Brought about the Missouri Compromise.
6. Captured the City of Mexico during the Mexican War.
7. Founded the Colony of Maryland.
8. Made a great speech against the English Stamp Tax.
9. Was President of the United States during the Civil War.
10. Vetoed the re-chartering of the United States Bank.

IV. Historic Terms. (Seven minutes)

1. Second Continental Congress.
2. Lewis and Clark expedition.
3. Articles of Confederation.
4. Sherman Anti-trust Law.
5. Monroe Doctrine.
6. Fugitive Slave Law.
7. Dred Scott Decision.
8. Alien and Sedition Laws.
9. Nullification Ordinance of South Carolina.
10. Emancipation Proclamation.

V. Political Parties. (Five minutes)

VI. Divisions of United States History. (Five minutes)

VII. Map-Study. (Five minutes)

The first four groups of questions were given to all pupils; groups V to VII were omitted with the elementary school pupils.

Sources of the Data

Material was secured from a senior, a junior, and a freshman class in the University of Texas; from the senior, junior and freshman classes of two Texas State Normal Schools, the Sam Houston Normal Institute, at Huntsville, and the South-West

Texas State Normal, at San Marcos; and from the high and elementary schools of five Texas public school systems, as follows: Austin, Elementary (Winn School), Grades V–VII, High, Grades VIII–XI; Brenham, Elementary, Grades V–VII, High, Grades VIII–XI; Houston, Elementary (Austin School), Grades V–VII, High, Grades VIII, Low X, and XI; Huntsville, Elementary, Grades V–VII, High, Grades VIII–X; and San Marcos, Elementary, Grades VI–VII, High, Grades VIII–XI.

The senior class in the University of Texas was composed of students who were taking work in practice teaching preparatory to teaching in the high school. It was, therefore, a selected group. All the members of it had had courses in history, and many of them had specialized in history in the university. Both on this account and on account of their greater scholastic maturity they might have been expected to make the best showing of any of the classes examined, yet they were surpassed by both the other university classes, and by two classes in one of the normal schools. The freshman class was a class in education composed of students who had formally stated in writing before being allowed to enter the class that it was necessary for them to leave college and teach at the end of the academic year. One of these students made the highest score attained in the tests. The junior class was likewise a class in education, and made the highest average score of any group tested, except one of the normal school groups.

The work of the Texas state normal schools was at that time practically equivalent to the work of the last three years of the average high school. (It has since been materially modified.) The students, however, were somewhat more mature, and since they were definitely preparing to teach, took a slightly different attitude toward the work. Opportunity is given for a full year's work in United States history in the normal, and many of the students have had as much as three years' work in history.

The elementary schools examined had only seven grades, and the high schools comprised grades eight to eleven. This is generally the case in Texas public schools. Supplementary reading books of a historical nature are used in the fourth and fifth grades, and in the sixth or seventh grade a half year is devoted to Texas history. United States history is systematically studied in the eighth year, with a review in the tenth or eleventh year in con-

nection with civics. All the elementary schools were divided into low and high sections, with semi-annual promotions, but this was neglected in grouping the results. The Austin and Houston high schools also have low and high sections reciting in separate classes, but their results have been grouped together. There was no eleventh grade class available in the Huntsville high school, and no results were secured from the ninth or high tenth grades of the Houston high school.

Administration of the Tests

All the tests were given in person by one of the authors (McCollum).[3] Printed slips with the questions for each set of tests were fastened together in bundles, and one of these was placed face down on the desk before each pupil. On the back of the bundle the pupil wrote his name, class, school, the amount of history he had previously studied, and the school years in which this study had occurred. The directions for each set were given orally, and were repeated until all understood what was to be done. Some teachers were inclined to doubt whether enough time was allowed for some of the tests, but after they saw the tests given they agreed that the time was ample.

Scoring and Tabulating the Results

Papers were obtained from over fifteen hundred students. Some papers were discarded as defective, and exactly fifteen hundred were tabulated. Each question in the first four groups was given a value of ten, and a perfect score on the whole group thus amounted to one hundred. The original plan of counting each answer right or wrong was soon found to be undesirable, and approximations to a correct answer were assigned a proportionate value. In answer to the question on political parties it was rare to find more than five or six paries mentioned, so it was decided to give a rating of five for each party correctly named, and five for the mention of one principle advocated by the party. The highest score obtained by anyone on this question was ninety-five, with perhaps a half dozen scores in the eighties, so that in computing percentages 100 was arbitrarily taken as a perfect score. The answers to the questions on

[3] This was made possible in the case of the two normal schools and four of the city school systems through the kind interest and coöperation of Professor L. W. Sackett, of the Department of Education, University of Texas.

Divisions of United States History and on the acquisitions of territory were each evaluated quite arbitrarily on the basis of 100. Since the same examiner marked all the papers it was thought that sufficient uniformity would be gained in this manner.

From the data given by the pupils regarding their previous study of history an attempt was made to record the amount of time that had been devoted to the subject by each pupil, and the recency of this study as indicated by the time that had elapsed between the last study of history and the writing of the test paper. The results were tabulated, and are presented in the first two columns of Table I for what they are worth. The authors do not place great confidence in the figures, for the information was very carelessly and fragmentarily given, the pupils suffered from lapses of memory, and some included the study of any and all history while others confined themselves to United States history.

The answers of the pupils to each question were tabulated on large sheets of cross section paper, with a vertical column to each question, and the results for each pupil were entered on one horizontal line. After each group of questions a column was left for the "Sum," and on the extreme right a double column was marked "Total" (maximum 700). This "total" score divided by the maximum (400 for the elementary schools) gave the individual index for each pupil on the entire test. The percentile distribution of these indices in each class is given in Table II.

In tabulating the results the records of the boys and girls of each half grade (or each entire grade, where there were no half grades) were tabulated separately in order to bring out any sex differences. Since there was a marked and constant sex difference, and since the girls of a given grade usually outnumbered the boys, it was obvious that a better indication of the central tendency of a class or group of classes would be secured by finding the average performance for the boys and girls separately, and combining these averages directly, rather than adding the individual scores and dividing by the total number. This in effect treats the classes as though they were composed of an equal number of boys and girls, or reduces the results for each sex to the basis of 100.

Analysis of the Results

The combined results by schools and classes, expressed in percentages of correct replies to each question, are presented

TABLE I

General Results

	Yrs. of Hist. Study	Recency	I. Dates-Events											II. Men-Events										
			1861	1789	1620	1565	1898	1619	1783	1492	1776	1846	Ave.	Burgoyne	Hamilton	Davis	Raleigh	Calhoun	McCormick	Dewey	Houston	Williams	Oglethorpe	Ave.
34 U. of T. Seniors	1.7	5.	76	29	65	9	51	23	25	100	82	11	47	32	49	90	79	53	25	66	82	30	44	55
14 U. of T. Juniors	1.5	6.	71	43	66	36	75	14	49	93	93	34	59	51	49	75	81	66	7	77	100	60	82	65
27 U. of T. Freshmen	1.5	2.6	76	37	59	30	61	28	53	100	87	37	56	52	59	73	64	60	23	76	86	56	44	59
40 S. H. N. I. Seniors	1.7	1.4	73	22	63	32	74	31	41	98	92	41	57	49	30	81	71	59	8	69	86	55	62	58
22 S. H. N. I. Juniors	1.5	1.1	56	7	36	22	34	16	10	100	75	31	39	26	32	66	52	40	26	56	72	26	53	44
40 S. H. N. I. Freshmen	1.1	1.3	50	0	34	15	22	34	5	96	56	10	32	26	21	39	39	31	2	30	67	35	48	34
48 S. W. T. S. N. Seniors	2.5	1.5	62	67	54	42	53	28	49	93	80	31	55	73	78	76	63	67	29	70	81	37	59	62
29 S. W. T. S. N. Juniors	1.8	2.4	88	65	74	70	90	74	81	96	95	51	78	78	65	89	77	84	73	94	91	92	89	79
28 S. W. T. S. N. Freshmen	1.5	1.7	58	26	38	30	53	32	25	89	69	33	45	38	36	61	54	55	51	58	75	46	42	52
64 Austin, Grade XI	1.3	2.3	73	12	33	12	53	14	30	100	73	34	44	33	39	64	76	69	14	64	84	24	18	48
58 Austin, X	1.2	1.3	56	17	20	10	50	11	24	97	62	24	36	23	31	60	47	58	6	63	68	31	24	41
42 Austin, IX	1.4	.5	46	10	14	13	53	1	21	97	60	20	34	24	20	48	50	36	4	58	77	41	44	40
52 Austin, VIII	1.1	0	20	5	14	24	29	0	12	97	49	12	25	21	14	25	40	39	7	34	53	16	22	39
8 Brenham, XI	1.4	1.5	33	49	33	13	33	58	50	100	25	46	45	51	95	34	77	52	59	40	54	67	48	59
12 Brenham, X	1.1	.7	47	25	2	17	47	24	15	90	57	17	33	37	71	63	59	42	40	42	72	48	27	42
11 Brenham, IX	1.1	1.5	32	17	7	4	48	7	28	84	54	24	30	10	9	58	41	7	0	45	77	40	29	32
27 Brenham, VIII	1.0	.5	36	14	20	16	25	8	22	76	32	16	26	26	6	42	47	26	5	42	56	23	19	30
69 Houston, XI	1.9	3.2	52	63	49	9	66	2	25	93	76	27	48	33	78	87	64	61	7	73	92	31	33	76
31 Houston, X	1.1	2.0	38	19	15	6	60	0	44	98	51	6	34	9	21	52	51	21	6	71	85	19	30	36
86 Houston, VIII	1.0	0	38	19	22	12	44	16	14	78	56	15	30	38	66	43	55	29	6	47	88	48	38	46
13 Huntsville, X	1.3	3.2	47	0	5	5	68	5	22	100	45	38	34	13	19	60	68	79	0	73	88	48	46	49
21 Huntsville, IX	1.4	2.4	28	0	3	0	30	0	0	97	75	13	23	5	5	37	67	29	0	35	70	10	4	26
32 Huntsville, VIII	1.8	0	36	4	5	13	29	18	3	85	42	9	24	14	12	43	59	26	0	43	86	39	45	35
10 San Marcos, XI	1.6	.9	46	24	69	0	34	45	86	100	86	17	51	56	44	50	68	49	22	44	55	37	40	46
23 San Marcos, X	1.4	3.0	49	8	41	9	61	9	49	96	91	25	48	17	31	54	62	48	23	58	78	41	38	45
32 San Marcos, IX	1.3	2.0	52	7	27	15	56	0	37	94	69	10	37	15	21	51	50	38	5	44	79	26	33	36
77 San Marcos, VIII	1.3	1.1	42	2	26	11	37	2	48	98	47	9	32	9	8	33	46	35	4	31	80	26	25	28
42 Austin, VII	.5	0	28	0	6	3	17	0	1	83	24	6	16	0	2	17	34	18	3	30	46	0	8	16
36 Austin, VI	0	0	16	2	5	2	24	1	0	52	23	6	13	0	0	20	30	4	7	35	61	0	1	16
36 Austin, V	0	0	5	0	32	0	13	0	0	64	5	0	12	2	0	7	28	2	0	7	34	8	19	11
56 Brenham, VII	1.0	0	27	7	8	14	24	0	6	93	38	26	25	34	17	38	73	28	20	20	60	28	23	34
41 Brenham, VI	.5	0	27	0	4	2	22	4	2	98	47	27	23	3	1	34	47	7	2	19	71	18	13	21
20 Brenham, V	.7	0	0	0	1	1	22	0	0	88	18	11	15	0	0	6	35	5	0	5	40	6	21	11
42 Houston, VII	.5	0	25	0	4	0	25	1	0	92	30	21	19	5	10	18	35	11	0	19	84	3	5	19
42 Houston, VI	.2	0	10	0	7	0	16	0	5	47	17	3	11	1	0	17	35	10	0	20	65	4	10	16
49 Houston, V	0	0	6	0	3	0	7	0	0	19	5	2	4	5	0	6	41	8	0	14	55	9	9	15
34 Huntsville, VII	1.5	0	19	11	4	16	12	19	10	94	42	15	24	55	47	13	58	53	17	13	71	48	46	42
39 Huntsville, VI	.3	1.5	35	0	0	3	0	6	0	100	35	23	20	0	0	25	40	0	0	0	90	9	0	17
44 Huntsville, V	0	0	9	0	2	0	3	0	0	90	7	2	10	0	0	0	84	0	0	2	38	0	6	13
32 San Marcos, VII	1.2	0	9	12	25	23	18	3	1	86	58	10	25	37	60	14	45	38	0	15	71	29	21	31
13 San Marcos, VI	1.0	0	21	11	0	6	29	0	0	82	19	33	20	16	10	11	59	22	0	29	71	47	29	29

TABLE I (Cont.)

	III. Events-Men											IV. Historic Terms										V VI VII			
	Quebec	North Pole	Decl. Ind.	Telephone	Missouri Comp.	Mexico City	Maryland	Stamp Tax	Civ. War Pres.	U. S. Bank	Ave.	2nd Cont. Cong.	Lewis & Clark	Art. of Confed.	Sherman Law	Monroe Doct.	Fug. Slave	Dred Scott	Alien & Sed.	Null. Ord.	Eman. Proc.	Ave.	Pol. Parties	Hist. Per.	Map	Total %
34 U. of T. Seniors	34	59	75	18	9	18	26	24	91	12	37	28	64	44	11	58	58	24	5	2	60	36	27	58	39	42
14 U. of T. Juniors	39	61	69	34	29	21	34	43	86	43	46	21	66	63	35	73	69	39	26	31	67	50	32	74	57	55
27 U. of T. Freshmen	41	76	63	37	33	22	28	31	91	26	45	43	41	59	20	76	72	50	21	10	73	46	40	67	47	51
40 S. H. N. I. Seniors	51	81	68	8	29	17	25	37	85	23	43	27	40	35	6	22	56	20	16	5	45	31	30	53	30	43
22 S. H. N. I. Juniors	49	79	76	23	29	16	18	48	79	6	42	13	35	32	18	53	49	33	3	8	33	28	20	40	32	34
40 S. H. N. I. Freshmen	21	75	61	4	18	10	19	23	51	25	32	11	35	15	15	30	24	27	23	1	15	20	20		12	25
48 S. W. T. S. N. Seniors	68	82	81	21	34	4	38	26	75	18	45	62	40	84	28	69	62	33	6	2	30	42	43	58	42	49
29 S. W. T. S. N. Juniors	93	93	89	49	71	63	67	64	86	31	71	76	68	89	52	84	71	71	65	38	63	68	49	73	55	68
28 S. W. T. S. N. Fresh.	39	87	68	23	24	31	29	30	66	16	42	30	42	23	26	55	50	46	26	21	25	36	32	33	42	40
64 Austin, Grade XI	48	92	51	40	12	16	11	13	83	8	37	20	39	54	36	59	44	20	5	4	43	33	31	28	19	35
58 Austin, X	48	82	53	22	11	16	0	18	70	22	34	19	29	33	28	38	64	29	1	12	34	28	24	35	15	31
42 Austin, IX	28	90	43	13	27	14	8	29	72	4	32	7	17	26	18	50	54	47	3	11	23	27	26	33	19	30
52 Austin, VIII	21	77	40	16	14	7	7	22	52	3	26	10	26	21	11	40	24	16	4	3	17	19	20	26	20	22
8 Brenham, XI	9	69	75	25	34	42	42	0	59	65	44	31	45	51	9	55	73	89	40	35	89	49	26	47	26	42
12 Brenham, X	0	73	20	20	35	30	52	20	83	42	38	47	29	47	0	49	59	67	5	10	53	37	34	33	37	37
11 Brenham, IX	23	66	23	7	17	17	17	23	75	0	27	0	58	23	0	32	19	12	20	4	22	19	21	34	22	26
27 Brenham, VIII	21	76	21	23	21	13	13	23	54	16	29	21	49	10	8	42	42	25	8	2	40	25	21	32	23	26
69 Houston, XI	55	96	55	48	23	22	10	35	82	5	42	20	32	56	34	73	44	16	9	4	58	35	37		32	41
31 Houston, X	21	91	39	31	0	11	4	7	83	15	31	1	35	4	34	41	24	6	1	2	38	19	23		41	26
86 Houston, VIII	43	86	57	42	13	22	26	41	65	9	40	16	25	30	8	34	25	9	4	4	27	19	21	37	28	32
13 Huntsville, X	50	58	69	17	0	22	10	39	85	0	45	5	32	21	17	49	34	3	0	2	42	20	18		37	32
21 Huntsville, IX	26	84	26	0	7	0	0	23	52	0	22	1	25	0	2	7	16	5	3	0	26	8	10		19	18
32 Huntsville, VIII	54	79	56	4	8	7	18	27	59	2	32	17	37	1	8	22	26	15	3	3	10	14	12		14	22
10 San Marcos, XI	62	99	100	7	24	17	72	48	93	0	53	28	18	32	27	37	33	12	7	7	47	28	27	25	37	38
23 San Marcos, X	51	91	93	61	14	34	23	37	96	5	50	18	43	30	26	61	52	19	1	4	37	32	22	32	30	36
32 San Marcos, IX	40	77	50	17	17	20	13	36	64	10	34	13	39	29	16	29	18	20	2	8	28	21	23	21	25	28
77 San Marcos, VIII	29	71	50	12	8	14	7	25	61	5	28	7	40	8	5	35	29	23	8	3	19	16	16	19	21	23
42 Austin, VII	9	65	8	5	0	0	0	3	37	0	13	0	11	0	2	0	3	0	0	0	10	3				12
36 Austin, VI	12	41	2	3	0	0	5	7	22	4	10	1	7	0	2	3	0	0	0	0	33	5				11
36 Austin, V	14	17	0	0	0	0	1	18	10	0	6	0	8	0	0	0	0	0	0	0	0	1				8
56 Brenham, VII	18	65	52	32	14	28	16	25	51	22	32	19	30	19	4	20	24	7	10	11	7	15				27
41 Brenham, VI	6	91	20	3	2	2	19	18	51	0	21	2	5	8	12	8	1	5	0	0	5	5				18
20 Brenham, V	0	67	0	0	0	0	15	0	9	0	9	0	0	0	0	5	0	3	0	0	0	1				9
42 Houston, VII	13	84	20	6	0	6	4	3	56	0	20	1	13	0	7	0	6	2	1	0	19	5				15
42 Houston, VI	0	78	19	3	0	4	7	3	38	0	15	0	6	0	4	0	3	0	0	1	13	4				12
49 Houston, V	7	53	8	11	0	4	0	8	35	0	13	0	8	0	0	0	0	0	0	0	3	1				8
34 Huntsville, VII	43	62	55	0	38	7	22	62	38	42	36	37	38	47	0	29	20	4	11	33	10	23				31
39 Huntsville, VI	45	78	3	0	0	0	0	8	13	0	15	0	8	0	0	6	3	0	0	0	4	2				13
44 Huntsville, V	4	6	24	3	0	0	3	12	6	2	7	0	0	0	0	2	0	0	0	0	0	0				8
32 San Marcos, VII	10	59	70	0	0	4	20	49	41	0	26	21	58	26	0	4	4	2	34	2	2	16				25
13 San Marcos, VI	17	70	48	0	0	0	17	36	53	0	25	0	27	0	0	0	6	0	0	0	0	3				21

in Table I. In column one is indicated the time in years that the pupil has studied United States history, as computed from his statements on the test sheets. As was said above, these statements were not very satisfactory, and the figures in column one can be taken only in a very general way to indicate the amount of time spent on the subject. As far as they go, they would seem to indicate that there is no connection between the amount of time spent on the study and attainments in the tests, for high school and normal school pupils. This is even more apparent from an examination of the individual records than from the class scores given in the table. Perhaps the reason for longer study on the part of many of the pupils is that they found the subject difficult, and were obliged to take some parts of the work over. This would cause the duller pupils to show the longer time.

It was thought that recency of study of the subject might be associated with higher grades in the tests, and in column two of Table I the interval between the last study of United States history and the date of the tests was estimated from the pupil's statements on the test sheets. While this might account for the relatively low scores of the university seniors, it does not hold at all of the normal and high school pupils, and the university juniors, who claim to be the farthest away from the subject of any group, make almost the best showing. The only general tendency observable is a small, irregular increase in the scores with increasing academic age. Whether this represents the net increment of further study, or comes from broader reading and incidental information is hard to say. Perhaps both factors contribute to the result.

On the whole the university students show the superiority that would naturally be expected of them. In spite of the fact that the seniors do not do as well as the juniors and freshmen, the scores of the university students as a group are higher than those of any other group except the South-West Texas State Normal. The comparison of the two normal schools shows the most striking difference to be found in the whole table. From two schools under the same general control, with practically the same course of study, the same salary schedule, and the same aims, one would scarcely expect to find such a divergence. Immediately rises the query, is the difference due to the conduct of the class work, or to some selective factor affecting the pupils?

There can be little doubt that good class work is done at the South-West Texas Normal. The individual scores, especially of the juniors, run very high, and make a good showing on those questions that indicate a knowledge of constitutional history, as in Group IV, Historic Terms. On the other hand, it will be noted that the two senior classes are not as far apart as the two freshman classes, indicating that with the material available the Sam Houston Normal has done the best work. The ascription of the difference in the showing of the two schools to fundamental differences in pupils is supported by two other considerations. First, San Marcos, the seat of the South-West Texas Normal, is located in the center of a prosperous, intelligent and progressive community, and draws its pupils from homes of the better sort. Huntsville, where the Sam Houston Normal is located, is by no means so favorably situated. Second, a comparison of the results from corresponding classes in the San Marcos and Huntsville high schools shows a similar difference in pupils drawn from those localities but having no connection with the normal schools. Thus the mere difference in final scores does not warrant any conclusions as to the school in which the best work is done.

The final average per cents. of the five high schools are Austin 30, Brenham 33, Houston 33, Huntsville 24, and San Marcos 31. With the exception of Huntsville the schools present about the same general picture—wide variations in the responses to particular questions, but these variations balancing each other. In the elementary schools the final average per cents. are Austin 10, Brenham 18, Houston 12, Huntsville 17, and San Marcos 23. It must be noted that for San Marcos we have only the sixth and seventh grades. Comparison of the results grade by grade shows that Austin and Houston are in the same class and that the other three schools are distinctly in advance, making at least fifty per cent. better showing. Column one, however, shows the reason. In the Austin and Houston schools no work in history is given before the seventh grade, while in the other schools the pupils begin history in the fourth or fifth grade. In view of the fact that pupils who have begun history later make as good a showing in the high school as those who began it earlier (compare Houston with Brenham or San Marcos) it might be argued that the study of history by elementary school pupils is

a waste of time. The case, however, is by no means so simple. The high schools of Houston and Austin have the reputation of being very well administered and of having an exceptionally high grade of teachers. If the other cities had as well organized and equipped high schools perhaps their pupils would have made a better showing. Surely a grade of 33 in 100 on the simplest and most obvious facts of American history is not a record in

TABLE II.

Percentile Distribution of Individual Scores

	Lowest	10%	20%	30%	40%	50%	60%	70%	80%	90%	Highest	Ave.
34 U. of T. Seniors	18	20	28	38	42	43	44	48	51	61	73	42
14 U. of T. Juniors	18	27	35	43	53	56	63	67	74	78	86	55
27 U. of T. Freshmen	16	24	33	39	46	58	63	66	76	78	93	51
40 S. H. N. I. Seniors	8	25	28	34	38	40	48	53	58	70	82	42
22 S. H. N. I. Juniors	6	13	16	24	27	37	37	39	47	57	68	34
40 S. H. N. I. Freshmen	8	9	15	16	17	22	23	28	31	42	68	25
48 S. W. T. S. N. Seniors	18	31	33	36	43	45	49	55	62	69	79	49
29 S. W. T. S. N. Juniors	20	35	48	59	61	63	75	77	81	84	90	67
28 S. W. T. S. N. Freshmen	3	5	9	20	29	34	37	52	63	69	83	39
64 A. H. S., Grade XI	11	16	21	22	27	31	34	37	48	55	74	35
58 A. H. S., X	3	11	18	22	24	28	33	38	49	54	60	31
42 A. H. S., IX	0	15	21	22	25	27	30	33	39	43	62	30
52 A. H. S., VIII	3	6	7	12	13	15	20	23	30	41	62	22
8 Brenham H. S., XI	20		30		44	45	48		63	72	82	42
12 Brenham H. S., X	10	16	17	24	25	26	35	35	39	72	84	37
11 Brenham H. S., IX	3	3	8	11	13	16	26	31	36	45	66	26
27 Brenham H. S., VIII	5	5	7	8	11	14	22	35	46	51	66	26
69 Houston H. S., XI	13	17	25	28	33	40	43	49	53	58	84	41
31 Houston H. S., X	11	14	16	18	19	21	24	28	31	34	56	26
86 Houston H. S., VIII	4	11	15	18	26	29	35	41	47	57	69	37
13 Huntsville H. S., X	8	9	12	14	20	24	25	27	33	45	64	32
21 Huntsville H. S., IX	3	3	8	10	12	13	15	17	25	31	43	18
32 Huntsville H. S., VIII	6	9	12	13	14	20	23	25	34	38	48	22
10 San Marcos H. S., XI	18	18	18	21	32	32	42	45	45	54	63	38
23 San Marcos H. S., X	13	13	18	25	30	36	38	40	42	47	68	36
32 San Marcos H. S., IX	1	10	13	16	21	22	27	33	41	52	72	28
77 San Marcos H. S., VIII	1	6	10	14	18	20	23	27	34	44	67	23
42 Austin, VII	0	3	5	7	9	10	12	13	14	19	39	12
36 Austin, VI	0	1	3	4	5	8	9	10	13	18	36	11
36 Austin, V	0	0	3	3	4	6	7	8	11	14	23	8
56 Brenham, VII	5	7	10	13	15	20	23	28	35	48	74	27
41 Brenham, VI	6	9	11	13	15	17	20	23	29	32	51	18
20 Brenham, V	3	4	5	5	6	6	9	10	10	12	23	9
42 Houston, VII	6	7	8	9	11	12	16	18	22	25	36	15
39 Houston, VI	0	0	3	5	6	9	10	12	13	20	29	12
49 Houston, V	0	1	3	4	4	5	6	7	9	14	42	8
34 Huntsville, VII	9	13	19	24	25	27	28	35	40	45	73	31
39 Huntsville, VI	2	5	8	12	13	13	15	15	16	20	26	13
44 Huntsville, V	0	4	5	5	6	6	8	8	9	13	27	8
32 San Marcos, VII	5	5	11	13	17	23	30	32	34	35	44	25
13 San Marcos, VI	7	10	10	12	17	18	19	22	25	30	40	21

which any high school can take great pride. Again the mastery of such facts as were involved in this test is only an insignificant part of the value of history for elementary school pupils. Whether any series of tests can bring out this value is a problem for further study.

Table II gives the percentile distribution of the individual scores in each grade or class. The individual score was found by dividing each pupil's total credits times 100 by the maximum. In the table the 34 University of Texas Seniors are seen to have received scores ranging from 18 to 73, with the ten percentile at 20, the twenty percentile at 28, etc. The average in the case of the normal and public school pupils was obtained not by combining the individual scores directly, but by combining the boys and girls separately, and then combining these averages. Since there were always fewer boys than girls, and since the boys usually had the higher scores, the averages are slightly higher than would have been the case if the scores had been combined directly. This accounts in part for the fact that the average is generally higher than the median. In the college classes the boys were so few in number (two in each class) as to be negligible.

Inspection of this table shows a wide range of individual scores in each class. The highest individual score (93) was made by a girl in the university freshman class, and the next highest by a boy in the junior class of the South-West Texas Normal. It is noteworthy that at least two seventh grade pupils made scores as high as the highest made by any university senior.

Of the four principal groups of questions in Table I, Group II (Men-Events) was the easiest, and Group IV (Historic Terms) was the hardest. On the whole, however, the groups were fairly evenly balanced. Taking the combined averages of the 875 normal and high school pupils as a basis the average scores for each group were as follows: I. Dates-Events, 43. II. Men-Events 49. III. Events-Men 41. IV. Historic Terms 32. V. Political Parties 28. VI. Periods of History 40. VII. Map 31. Table III gives the ranking of the first forty questions according to the average of the normal and high school pupils. In parallel columns are given the averages of the combined normal, high and elementary school pupils, and the university, normal, high, and elementary school groups taken separately. This table shows how much and what sort of variation there was in the ranking of the questions according to the returns from each group.

TABLE III.

Ranking of Questions

		875 Norm. & H. S. Av.	1425 Norm. H. S. & El.	75 U. of Tex.	207 Normal	668 High School	550 Elementary
1.	1492	95	89	98	96	93	78
2.	North Pole	82	75	65	83	81	59
3.	Houston	78	73	52	79	76	62
4.	Civil War Pres	73	60	89	74	72	33
5.	1776	68	53	87	78	58	27
6.	Declar. of Independ	63	50	69	74	51	25
7.	Jefferson Davis	60	45	79	71	49	16
8.	Raleigh	59	54	75	60	57	47
9.	Dewey	57	43	73	63	51	17
10.	1861	55	44	74	65	44	17
11.	Monroe Doctrine	51	35	69	59	42	5
12.	1898	50	39	62	54	46	17
13.	Calhoun	49	39	60	56	41	16
14.	Fugitive Slave Law	46	32	66	54	37	5
15.	Oglethorpe	45	35	57	59	31	16
16.	Quebec	45	35	38	54	36	14
17.	Roger Williams	41	33	49	47	34	17
18.	Lewis and Clarke	39	32	57	44	34	18
19.	Articles of Confed	37	25	55	46	27	8
20.	Burgoyne	37	29	45	49	24	13
21.	Hamilton	36	28	52	44	28	12
22.	1620	36	27	63	50	22	8
23.	Emancip. Proclam	35	26	67	36	34	7
24.	1783	32	21	42	35	28	2
25.	Stamp Tax Speech	32	26	33	38	26	19
26.	Dred Scott Decision	31	21	38	39	23	2
27.	1846	27	22	27	33	20	14
28.	2nd Cont. Cong	27	21	31	37	16	6
29.	Maryland Colonized	26	20	26	33	18	10
30.	1789	25	17	36	32	17	4
31.	Missouri Compromise	25	18	24	35	15	4
32.	1619	24	17	22	36	12	3
33.	1565	23	17	25	36	10	6
34.	Telephone	23	15	30	22	23	5
35.	McCormick	22	16	18	32	11	4
36.	Mexico City	21	15	20	24	17	4
37.	Sherman Law	21	14	22	25	16	2
38.	U. S. Bank	16	12	27	20	11	5
39.	Alien and Sedition Laws	16	12	17	24	7	5
40.	Nullification Ordinance	10	7	14	13	6	4

It will be seen that the date 1492 has the highest percentage of correct answers in each of the groups. The dramatic element in the discovery of the North Pole probably accounts for the fact that it comes second with high school children. In this connection it is interesting to note that a large number of Texas children are still inclined to give Cook the credit for that discovery. Where both Peary and Cook were mentioned the full score was given. In perhaps eighty per cent. of the correct answers Peary's name was spelled Perry. That Sam Houston has such a high place on the list is undoubtedly due to the fact that he was the local hero and father of the Texas Republic. Many of the children thought that he captured Mexico City. That Lincoln's name as Civil War President is not more familiar to Texas children is perhaps not surprising. Many gave Jefferson Davis. The fact that 1776 is only a little over half as familiar to high school pupils as 1492 calls for some explanation. In New England or the Atlantic states the score would be higher. Texas children are far from the scenes of the Revolution, and local interest centers in Texas independence rather than in the Declaration of Independence of the colonies. Jefferson Davis was frequently confused with Thomas Jefferson. Raleigh was familiar from the stories in the readers, and Dewey is held in mind as a great naval hero. The Monroe Doctrine was the most familiar of all the historic terms, with the Fugitive Slave Law next. Wolfe and Montcalm were assigned with equal frequency as the captors of Quebec. The Articles of Confederation were ascribed to the Confederacy, and the fact that the Emancipation Proclamation was a war measure and applied only to the states then in rebellion was quite generally overlooked. The uncertainty about the date 1846 is striking, since the war with Mexico was so vitally concerned with Texas. The scores on the invention of the telephone, McCormick, and the Sherman Law indicate how little attention is paid to social and economic development in the teaching of history. The veto of the re-chartering of the United States Bank, the Alien and Sedition Laws, and the Nullification Ordinance of South Carolina are technical points that would scarcely be expected to be very familiar to school children. In general those who answered these questions correctly got high percentages in the totals.

The scores on the question about political parties were remarkably low. Only the South-West Texas Normal, the university

freshmen, and the Houston eleventh grade showed an adequate appreciation of political affairs. The grades on historical periods or epochs were higher, but the divisions of history are so much a matter of individual taste and opinion that the only course left for the examiner was to give a good mark in case a reasonable outline of United States history was given. The map exercise gave a test of territorial history that was very difficult for some, but showed a high correlation with the average (r=.83).

Sex Differences

Owing to the fact that girls usually get higher school marks in history than boys, and that in co-educational colleges where many elective courses are offered the girls seem to prefer history and literature, the authors expected to find a slight sex difference in these tests in favor of the girls. They were not a little surprised, therefore, to find a constant and marked superiority manifested by the boys. Table IV shows how uniform this tendency is for all classes in all groups of tests, and the detailed tables (which cannot be published here) reveal the same difference in a more extended fashion. The average difference for high school pupils is eight points (Boys 34, Girls 26), or a superiority on the part of the boys of about 31 per cent. For the normal schools the average difference is six points, and for the elementary schools four points. This striking superiority of the boys holds with almost every group on all but a few questions. One of the exceptions was the question on Periods of History, in which, as is shown in the table, the girls were generally superior. Another, curiously enough, was the question which showed the highest frequency of correct answers,—the date 1492. In only nine out of twenty-four high and normal school classes did the boys get a higher score on this date than the girls. All the other dates showed a considerable difference in favor of the boys. Why the girls should do so much better on this one date is a matter for speculation.

In their study of history text-books for elementary schools Bagley and Rugg[4] gave a list of the men most frequently mentioned, calling it the "Hall of Fame." If we consider all of the men who are at all involved in the answers to our questions, and

[4] W. C. Bagley and H. O. Rugg. *The Content of American History as Taught in the Seventh and Eighth Grades.* University of Illinois Bulletin, 13: No. 51, 1916.

TABLE IV.

Sex Differences

	Dates-Events	Men-Events	Events-Men	Hist. Terms	Pol. Parties	Hist. Per.	Map	Total %
34 S. H. N. I. Boys	35	46	43	25	26	26	27	34
68 S. H. N. I. Girls	19	44	35	28	21	53	21	33
31 S. W. T. S. N. Boys	45	72	58	54	48	56	53	57
74 S. W. T. S. N. Girls	32	57	46	43	34	53	39	47
99 Austin H. S. Boys	44	45	37	30	28	28	22	33
117 Austin H. S. Girls	30	39	23	23	23	32	15	26
20 Brenham H. S. Boys	36	42	39	30	29	33	33	35
38 Brenham H. S. Girls	31	39	30	34	22	40	21	31
70 Houston H. S. Boys	40	52	42	29	31		29	37
116 Houston H. S. Girls	34	54	32	19	23		38	28
20 Huntsville H. S. Boys	30	44	34	18	17		36	30
46 Huntsville H. S. Girls	23	30	24	10	10		11	18
57 San Marcos H. S. Boys	47	48	51	29	24	23	36	37
85 San Marcos H. S. Girls	36	29	31	19	19	26	20	25
53 Austin Elem. Boys	15	18	12	4				12
61 Austin Elem. Girls	12	10	7	2				8
57 Brenham Elem. Boys	23	25	22	7				19
60 Brenham Elem. Girls	19	19	19	6				16
54 Houston Elem. Boys	13	21	22	10				15
79 Houston Elem. Girls	9	12	10	3				8
60 Huntsville Elem. Boys	17	25	19	9				18
57 Huntsville Elem. Girls	19	22	19	11				18
21 San Marcos Elem. Boys	26	36	30	10				26
24 San Marcos Elem. Girls	19	24	21	9				20
579 Total Boys	37	43	37	25	31	35	36	33
846 Total Girls	32	35	28	21	24	45	26	27

compare them with Bagley and Rugg's list we find eleven names common to both, i. e., Lincoln, Jefferson, Davis, Monroe, Calhoun, Burgoyne, Hamilton, Henry, Clay, Scott, and Jackson. Ranking these in order according to the results of the two studies we find that Lincoln comes first and Jefferson second on both lists, and that the Pearson coefficient of correlation for the two lists is r = .52. The two studies are so entirely different in nature that it is remarkable to find such an agreement existing between them.

Summary

1. Simple questions on fundamental aspects of United States history are answered by high school pupils with 33 per cent. correct responses, by normal school pupils with 43 per cent., and by university students with 49 per cent. The upper three grades of the elementary school have only 16 per cent. correct. This does not show a very thorough mastery of basic historical facts.

2. Each class and group studied shows a wide variation ln individual scores, ranging for the better groups from 20 to 90, and for the poorer ones from 0 to 23. Some seventh grade pupils make as good a score as the best university senior.

3. In general the biographical questions are more correctly answered than the dates or the historic terms. The latter set of questions is the more indicative of historical ability.

4. The boys are markedly superior to the girls in almost every class. The amount of this superiority ranges from 4 points (28 per cent.) in the elementary schools to 8 points (31 per cent.) in the high schools. This superiority is seen in the answers to all but a few questions. On the most familiar question, however (1492), the girls show a pronounced superiority over the boys.

5. The average accuracy with which the different questions were answered varies from 95 per cent. (1492) to 10 per cent. (Nullification Ordinance of South Carolina).

6. It would be of interest to have the same questions given in other sections of the country, to determine how different localities compare in the familiarity with basic facts of United States history manifested by public school pupils.

DELAYED RECALL IN HISTORY

GARRY C. MYERS

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Of the large number of studies on memory, most have been, for obvious reasons, on immediate recall, recall after a few minutes, a few hours, or, at most, a few days. Recall delayed for a longer time has been studied by some writers, such as Norsworthy,[1] 30 days; Henderson,[2] 28 days; Strong,[3] 42 days; Huguenin,[4] 56 days; Myers,[5] 3, 4, 6, and 10 months, and 9 and 10 years. Wells[6] studied the retention of an acquired capacity to tap after five years.

Students of education have for some time realized the need of follow-up tests to determine how much of what is learned in school persists for use in later life. The work of Bonser,[7] in which grade children once tested for reasoning ability were followed up after about nine years; and that of Bird T. Baldwin,[8] on physical measurements of the same individuals for about 12 years, are samples of the kind of work greatly needed in other lines.

With a view to make a small preliminary measure of the recall of one-time familiar facts in history after the lapse of a year or more, this study has been made.

At the end of their first year in the Brooklyn Training School for Teachers, and one year from the completion of a course in

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[1] Norsworthy, Naomi. *Acquisition as Related to Retention.* 1912, Jr. Ed. Psychol. 3: 214–215.

[2] Henderson, E. N. *A Study of Memory for Connected Trains of Thought.* (Columbia University thesis.) Psychological Monographs, 5: No. 6, Whole No. 23, 1903. Pp. 94.

[3] Strong, E. K. *Effect of Time Interval upon Recognition Memory.*

[4] Huguenin, C. *Revivescence paradoxale.* Arch. de psychol. 1914, 14: 379–383.

[5] Myers, G. C. *A Study in Incidental Memory.* Arch. of Psychol. 1913, N. Y. Science Press. No. 26.

A Comparative Study of Recognition and Recall. 1914, Psychol. Rev., 21: 442–456.

Myers, Garry C. and Caroline E. *Reconstructive Recall.* 1916, Amer. Jr. Psychol., 27: 493–506.

[6] Wells, F. L. *Retention of Acquired Capacities.* Amer. Jr. Psychol. 1915, 26: 58–68.

[7] Bonser, Frederick. *Selective Significance of Reasoning Ability.* Jr. Ed. Psychol., 1916, 7: 187–201.

[8] Baldwin, Bird T. *Physical Growth and School Progress.* U. S. Bureau of Education, Bulletin No. 10, 1914. Whole No. 581, 215 pp.

U. S. history in the high school, 107 girls were asked to state, during a class period of 45 minutes, one important fact of American History which they could associate with the following 50 names: Dewey, John Cabot, King Philip, Eli Whitney, Early, John Jay, Montcalm, Cyrus W. Field, Hamilton, Rosecrans, Samuel F. B. Morse, Balboa, Fulton, "Stonewall" Jackson, McCormick, Sheridan, Schuyler, Martin Van Buren, Burgoyne, Winthrop, John Marshall, Wolfe, Roger Williams, William Lloyd Garrison, Peter Stuyvesant, Zachary Taylor, Shay, Daniel Webster, Burr, Daniel Boone, Bacon, Cartier, Burnside, James Oglethorpe, Schley, Lafayette, Citizen Genet, Stephen A. Douglas, William Penn, Ethan Allen, McDonough, Cornwallis, Drake, Patrick Henry, Robert E. Lee, Calhoun, Jefferson Davis, U. S. Grant, Green, Andros. Emphatic instructions were given to be specific; if it was the name of a general, for example, the war and the side on which he fought should be named; if an explorer, where he explored; if a statesman, the specific movement with which he was identified. Furthermore, they were told not to answer in sentences, but in the fewest possible words, and to designate those names with which they had never been familiar.

RESULTS

	Ave.	Per cent.
Number answers correct	22.7	45.4
Number answers partly correct	11.4	22.8
Number answers wholly wrong	7.5	15.0
Number "answers" not attempted	8.4	16.8

No one of the 107 answered all correctly. The highest number of correct answers to the 50 names, by any one individual, was 44; the lowest, 3, with an average of 22.7, M. V. 5.8. The corresponding figures for those answers partly correct were 27, 3, 11.4 and 3.5. Therefore, fewer than one-half the names elicited correct associates. About one-fifth were answered with partial correctness, one-seventh wholly wrong, and one-sixth were not attempted.

At the rate of 2 per cent. for each correct answer, and an estimated proportion thereof for partially correct answers, the average performance by the 107 girls was 58.5 per cent. (The average was computed on the basis of 50 names minus the 2.1 names labeled "never familiar.") A good deal of error is probable in the grading of the *partly correct* answers. However, were they all given perfect scores the average efficiency by the whole

group would be increased *only* by about 10 per cent., making a total of only 68.5 per cent. As it is, the partially wrong answers were graded on the average slightly more than half-correct.

About one name out of 3 either elicited no attempt to answer or a totally incorrect answer, and about one out of 25 was labeled as "never familiar." Thirty subjects reported none as "never familiar"; 24 reported one, and 1 reported fifteen. Assuming that all the names on the average but two were once associated with the correct historical unit, about 40 per cent. was lost between the time of mastery and that of recall.

Of course there is another assumption which is present in practically all educational measurements, namely that what is recalled on demand is a measure of what has been learned. Common sense questions that assumption, and recent experiments make it very doubtful. For example, Myers and Myers found in a study of *Reconstructive Recall*[8] that as high as 81 per cent. of a given poem, once familiar, was added in recalls subsequent to the first recall, without any relearning, and that "on the average the gain in total subsequent recalls was about half as much as the original selections and about twice as much as the first recall." The writer elsewhere found that of 47 boys "21 gave more words in the second recall (after one hour) than in the first (immediate) recall, with an average of two-tenths of a word more in the second than the third recall." For both sexes from one to six correct words were added (without re-study) in the second or third recall.[9]

Therefore, in measuring for efficiency in any school subject this factor offers a serious difficulty, which one is apt to overlook in interpreting results. A part of the retained but not-recalled elements of those once learned, doubtless function to no small degree in subsequent procedure with the subject in which measurement is attempted, and carry over as common elements to other subjects. Such factors are not readily measurable. Let it be remembered that all types of tests merely measure what at the time can be "cashed in." The results of this study should be considered with this in mind.

In addition to the difficulties already pointed out above it is evident that one has no assurance as to just how many of the

[9] MYERS, G. C. *Recall in Relation to Retention.* Jr. Ed. Psychol. 1914, 5: 119–130.

names the subjects ever learned in association with the correct historical element.[10] Furthermore, since only a small section of one subject was studied, one cannot infer whether, in relation to retention of other subjects, the performance was relatively good or bad.

All these difficulties granted, the value of measurements on the other hand is not to be greatly depreciated thereby. In the first place, at almost every turn in life one is tested for recall of some past experience to solve a problem on the spot.. Frequently one fails to recall the appropriate experience and discovers by later recalls just what was needed to solve the problem then presented. Life, then, is a continuous process of testing, without warning, for delayed recall.

Frequency of Recall

Although the 50 names for the test were only arbitrarily selected the order of their familiarity based on correct answers, with approximate per cent. of subjects answering each correctly, will be of some interest. They follow:

Eli Whitney	99	Montcalm	56	Ethan Allen	27
Fulton	96	Burgoyne	55	Genet	26
Zachary Taylor	89	Jefferson Davis	55	Oglethorpe	22
William Penn	88	Sheridan	52	Rosecrans	21
Van Buren	85	Drake	46	Calhoun	21
U. S. Grant	85	Hamilton	46	Greene	21
Balboa	83	Dewey	46	Schuyler	20
John Cabot	80	Burr	40	Webster	20
Stuyvesant	79	Garrison	40	John Marshall	17
Lafayette	72	Boone	39	Winthrope	16
Samuel F. B. Morse	70	Cartier	36	Bacon	16
Robert E. Lee	68	Jay	36	McDonough	15
Cornwallis	62	Douglas	37	Andros	15
"Stonewall" Jackson	60	Burnside	32	Schley	13
Roger Williams	57	Patrick Henry	32	Early	5
Wolfe	57	King Philip	32	C. W. Field	1
McCormick	60	Shay	31		

Bagley and Rugg,[11] studied the "Content of American History as Taught in the Seventh and Eighth Grades." They analyzed twenty-three representative histories published during the past fifty years, and they present a list of the twenty-five persons in civil life most prominent, and another list of the twenty-five persons in military and naval affairs most prominent, from 1765–1865. Among the names used by the writer there happen to

[10] In another study in progress this difficulty is receiving consideration.
[11] University of Illinois Bulletin, Aug. 1916. No. 51.

be ten of those of the civil list of Bagley and Rugg and ten of the military list. (Unfortunately the writer's test was made before the appearance of their work.)

A comparison is given below of the order of frequency for familiarity by the writer's subjects with the order of frequency of appearance of these names in history texts.

A Comparison with Bagley and Rugg's Lists

Order of Frequency

Civil List	Bagley & Rugg	Myers	Military List	Bagley & Rugg	Myers
Hamilton	1	4	Lee	1	3
Patrick Henry	2	8	Grant	2	2
Van Buren	4	2	Cornwallis	3	4
Calhoun	4	9	Burgoyne	4	6
Webster	4	10	"Stonewall" Jackson	5.5	5
Douglas	6	7	Greene	5.5	8
Jefferson Davis	7	3	Zachary Taylor	7	1
Zachary Taylor	8	1	Sheridan	8	7
Burr	9	5	Schuyler	9	9
Jay	10	6	Early	10	10
Correlation		−.261	Correlation		+.682

$$r = 1.00 - \frac{6 \Sigma d^2}{n (n^2 - 1)}$$

It is rather interesting that while the correlation is high for the military list it is practically zero for the civil list. Perhaps the discrepancy may mean that schools vary much more widely in the relative estimates of civil leaders in history than they do upon the warriors.

It would be highly interesting to submit in random order the names of the two lists of Bagley and Rugg to school children from the seventh grade upward from a number of representative schools of the United States, and to submit the same names to the same pupils a few years later.

Incorrect Recalls

In addition to the measurement of efficiency in terms of correct and partially correct recall this study reveals some interesting data on the nature of incorrect recall. Let it be noted that all the wrong answers comprised some correct unit of history, but wrongly associated. This fact is too frequently overlooked in practical school work. Likewise in most memory studies the nature of wrong responses has generally been neglected. Among

the first to consider it was Meumann[12] and Kirkpatrick.[13] The latter noted that for such words as *spool*, *thimble*, and *knife* which had been pronounced, some words as *thread*, *needle*, and *fork* were given in recall. Like phenomena are reported by Peterson[14] in a recent article.

Myers,[15] too, presented considerable data in an analysis of incorrect recalls by 391 subjects for immediate and delayed recall, and, in the March issue of this JOURNAL (p. 166) he devoted an entire paper to "Confusion in Recall."

A few examples in confusion are presented below:

"Stonewall" Jackson—General, Civil War, federal side (3);[15] General during French and Indian War; American General, Mexican War; Pres. U. S. and General, Civil War (4); Fought in New Orleans; Battle of Fredericksburg, American; Commander U. S. Army; Governor of Dutch.

Schuyler—General, French and Indian War; General, Civil War; American General, Civil War; British General in Revolution (2); Civil War Commander; U. S. Leader in Civil War; American Leader, Naval Victory, Spanish American War; Foreigner who fought in America during Revolution.

Burgoyne—Southern General, Civil War; French General in Civil War; General in Civil War (2); General, War of 1812; French General (3); French General surrendered in Revolution; French General, French and Indian War; French and Indian War, Battle with French; English General, French and Indian War; Surrendered at Appomattox Court House; American Commander, Revolution (2); Surrendered to Cornwallis; Battle of Burgoyne.

Winthrop—Governor of New York (2); First English Governor of New York (3); Governor of Georgia; Governor of Virginia (2); First Puritan Governor of Plymouth; One of Pilgrim Fathers; Founder of Connecticut; Religious Leader in Colonies; General in Revolution; American General in Revolution.

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[12] MEUMANN, E. *Intelligenzprüfungen an Kindern der Volksschule.* Die Experimentelle Pädagogik. 1905, 1: 35–101.

[13] KIRKPATRICK, E. A. *An Experimental Study of Memory.* Psychol. Rev. 1894, 1: 602–609.

[14] PETERSON, JOSEPH. *The Effect of Attitude on Immediate and Delayed Reproduction.* Jr. Ed. Psychol. 1916, 7: 530.

[15] The figures in parenthesis indicate the number of times the respective answers were given, in case they appeared more than once.

John Marshall—Vice President of U. S. (7); Secretary of State (2); Manufacturer of Kippered Herring; Commander in Civil War; Against Slavery in Civil War; Anti-Slavery Leader.

Roger Williams—Founded Connecticut (3); Governor of Connecticut; Governor of Maryland; Governor, Massachusetts Colony; Had something to do with the Indians; Advocate of Slavery; Puritan Martyr; Burned at the Stake; A great Preacher driven out by Anne Hutchinson.

Cyrus W. Field—Inventor (2); Inventor of Reaper (4); Inventor Sewing Machine; Mower; Telegraph (2); Wireless Telegraph (3); Locomotive; Lawn Mower; Newspaper writer; Writer (2).

Samuel F. B. Morse—A statesman; Inventor; Wireless Telegraphy (6); Cable; Telephone; Atlantic Cable; Invented Typewriter.

William Lloyd Garrison—(Probably confused with William Henry Harrison) President of U. S. (9); Secretary of War; General; Editor of First Newspaper; Famous Southerner.

Daniel Webster—Wrote Dictionary (14); Noted Editor of Dictionary, and Statesman (6); Orator and Dictionary (2); Pro-Slavery and Dictionary; Debated with Lincoln; Statesman and signer of Declaration of Independence.

Ethan Allen—A negro; Spy (4); English Spy (2); Hanged as a Spy; Traitor (3); Poet; Stony Point; Leader, Battle of Bull Run; American General, War of 1812.

Green—General, Civil War (15); Confederate General; General, Revolution, Southern Side; Union General, Revolution; American General, Civil War; Southern General; British General in Revolution; Leader of Green Mountain Boys in Revolution.

Robert E. Lee—President of U. S.; Invented Engine; General in Revolution; British General in Revolution; English General, Revolution; Naval Commander, Revolution; General in Civil War; Surrendered to Americans.

James Oglethorpe—Founded Maryland; Founded a health colony; Delaware Colony; Dutch Governor, New York; Pioneer in Rhode Island; Leader of freedom laws, Rhode Island; Aided Negroes; English Explorer.

From these examples, such as any teacher of history might readily cull from regular papers in tests, it is obvious that certain tendencies obtain:

(a) With practically no exception the wrong answers are statements of some historical facts, but facts wrongly connected.

(b) General ideas as to being a statesman, general, settler, governor, inventor, tend to carry over with considerable accuracy but their application to specific factors is often most uncertain.

(c) Likewise general ideas are confused, as Union and American, Confederate and British.

(d) Names are interchanged as Wolfe and Montcalm, Cyrus W. Field and Morse.

(e) Some names are confused with names of similar sound, as William Lloyd Garrison and William Henry Harrison.

(f) Some names are confused with other names of the same surname, as "Stonewall" Jackson and Andrew Jackson; McCormick, the inventor with the Irish singer.

Wrong answers deserve more careful study; in many cases they may give the teacher more and better information about his teaching and the pupil than can be obtained from the traditional study of correct responses.

For grading school papers, there needs to be a standardized scheme for estimation wrong answers, especially confused answers. Suppose for example, in a given test, correct historical events are to be assigned to the dates, 1492, 1565, 1783, and 1807, and the actual answers given are: 1492, St. Augustine was founded; 1565, Columbus discovered America; 1783, Fulton invented the steamboat; and 1807, Lincoln was assassinated. Now what shall be the values of the answers? Doubtless almost any one would assign zero to the last; but to the third some would give some credit, and considerable credit would be given frequently to the first two answers. Evaluation of these types could be readily investigated scientifically. In the absence of experimental data the third, theoretically, is no better than no answer. The first two, which indicate a certain degree of mastery are, if strictly measured in terms of ultimate efficiency, worse than no answers. One thing is pretty certain, most imperfect answers are graded far too high. There is a human tendency for the teacher to read meaning into answers and to bestow credit generously for the pupil's effort and his good intentions. Doubtless the writer's errors in this study are to the point, and, consequently, the average percentages assigned the partially correct answers are too high.

This rather obvious tendency to rate too highly confused, vague and imperfect answers, puts a premium upon careless learning. It may be that the teacher while aiming to develop scientific habits in the child is actually developing some of the most unscientific habits. The problem is not simple, for, while efficiency demands accurate responses, the fear of wrong responses induces the learner to make no response, although the indispensable factor of all learning is the response.

Summary

About 45 per cent. of the answers called for were correctly given; 23 per cent. were answered with partial correctness; 15 per cent. were wholly wrong; and 17 per cent. were not attempted. The total compiled efficiency was only 58.5 per cent. Presumably, then, about 40 per cent. had been lost.

Practically all the imperfect answers revealed confusion.

The order of familiarity for "military" names correlates rather highly (+.682) with Bagley and Rugg's frequency for mention by history texts, while there is practically no correlation for "civil" names.

There is a great need to measure delayed recall, in respect to the amount of things once learned which can be mustered into service several years after their first mastery. With tests devised so as to measure rather definitely the actual loss in retentiveness with time, one can hope eventually to measure relative values within a given subject, as well as the relative values of the several subjects, of the curriculum. To this end some preliminary studies on the same individuals to extend over several years are in progress.

A SCALE IN ANCIENT HISTORY[1]

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The material used in this study of the range of information in ancient history and the scaling of difficulty of ancient history questions was taken from Myers' General History and the ancient period was defined as closing in the year 800 A. D. The basis for selecting the questions was to include only questions which every pupil who takes a course in ancient history must encounter. Topics which were treated with equal emphasis could not be selected as that depends upon the pupil's interest and the teacher's method, but every student being tested was expected to feel at every point a sense of familiarity in the presence of every question. Even where there could be no adequate recall they should feel that they had known it at some time but had forgotten. To do this the test material was submitted to a number of teachers of ancient history and many valuable suggestions were obtained. Nothing was included which did not meet with general approval from these teachers. It was tried in a preliminary way among University Freshmen and Sophomores coming from a wide range of schools and from classes just completing ancient history in the high school. These students were asked to point out any features which they had never encountered in a study of ancient history. After inspecting their answers to the questions and their comments upon them, the following test material was adopted:

Test No. I. For what are the following men noted? (1) Hannibal. (2) Khufu or Cheops. (3) Demosthenes. (4) Darius. (5) Solon. (6) Charlemagne. (7) Attila. (8) Constantine. (9) Mithradates. (10) Justinian.

Test No. II. Name a man noted in ancient history for each of the following: (1) Orator. (2) Painter. (3) Sculptor. (4) Historian. (5) Law-giver. (6) Philosopher. (7) General. (8) Ruler (King, Emperor, etc.). (9) Builder. (10) Poet.

[1] Special mention should be made of the painstaking assistance of several of my advanced students: Misses Luella Tankersley, Mary Williams, Kathleen Molesworth, and Mr. W. P. Webb. No statement here can give just credit to my colleague, Dr. Truman L. Kelley, for his assistance in the mathematical aspects of the problem. The test material was originally arranged by Miss Hazel Marsh.

Test No. III. Give the historical significance of each of the following: (1) Battle of Tours. (2) Age of Augustus. (3) Battle of Milvian Bridge. (4) The church council of Nicaea. (5) Check of the Saracens before Constantinople. (6) Reign of Alexander the Great. (7) Age of Pericles. (8) Founding of the Hebrew Monarchy. (9) Burning of Carthage. (10) Peloponnesian War.

Test No. IV. Between whom were the following battles fought: (1) Arbela. (2) Marathon. (3) Metaurus. (4) Teutoburg Forest. (5) Chalons. Name the victor in each case.

Test No. V. Give the approximate date of each of the following: (1) Fall of Rome. (2) Battle of Marathon. (3) Crowning of Charlemagne. (4) Establishment of the Saracen Kingdom in Spain. (5) Delian League. (6) The Hegira. (7) Defeat of Saracens by the Germans. (8) Battle of Actium. (9) Defeat of Persians by Alexander. (10) Establishment of the Roman Empire.

Test No. VI. What do you consider the most important contribution to civilization from these peoples? (1) Greeks. (2) Teutons. (3) Phoenicians. (4) Saracens and Arabians. (5) Romans. (6) Hebrews. (7) Persians. (8) Egyptians. (9) Babylonians. (10) Prehistoric Man.

Test No. VII. Mark each of the following peoples as being Hamitic, Semitic, or Aryan: (1) Greeks. (2) Egyptians. (3) Romans. (4) Hebrews. (5) Hindus. (6) Babylonians. (7) Teutons. (8) Assyrians. (9) Phoenicians. (10) Persians.

Test No. VIII. Name and mark the geographical locations on the accompanying map of ten points that you think were most important in ancient history. (Here was inserted an outline map of the Mediterranean World.)

The tests were arranged in a packet with blank spaces for answers and with the brief instructions at the top of each list of ten questions. Four minutes were allowed to each of the eight tests thus bringing the whole series with the preliminary information and the supplementary comments well within the 45-minute period. This time, short as it may seem, was decided upon after repeated trials during which the actual time consumed was observed. Even in regularly giving the tests there seemed to be little disposition to call for more time, or to give evidence of being hurried. Teachers who coöperated in giving the tests

and who anticipated that the time allowed would be inadequate were satisfied when they saw them given. Pupils were asked to write on an attached blank page their comments, criticisms, and complaints. Few complained of the time allowed and most reported that it had given them a fair opportunity to reveal what they knew, or rather that it had revealed to them how little they really remembered.

The nature of the questions combined with the manner in which they were presented test only one particular phase of historical information; viz., the ability to recall definite facts promptly. One of the chief marks of culture along historical lines, however, is to be able, when a lecturer mentions Greek philosophy, to think promptly of one or more exponents; when an ancient nation is mentioned, to be aware at once of some of the chief attributes and contributions of its people; when a battle which represents a turning point in civilization in mentioned, to know the contending forces and the results of the struggle. Thus the tests and the resulting scale measure only a limited and specific, though not an unimportant, kind of historical ability.

On the matter of grading pupils' answers, certain difficulties arose which are not present in arithmetic and spelling tests. The pupils' reactions could not be graded on the absolute standard of right or wrong. In nearly every attempt there were varying degrees of rightness or wrongness. The answer might be a real error or a wide variation from an otherwise correct reaction. To obviate this difficulty as much as possible all grading should have been done by the same person, so that the same standards of grading would be back of the evaluation of the questions. It was found to be impracticable to ask one person to make eighty judgments each on 933 pupils. Two directors of the grading were chosen and they worked over the correct and adequate answers which would be counted as 10 per cent, those that would be considered 5 per cent., and those for certain intermediate points. Sometimes this varied far enough from the method of right and wrong answers to be almost an arbitrary, but it was thought a more equitable, assignment of values. These two persons graded many of the papers and personally supervised and coached the assistants who also took part in the grading.

The following will serve as a sort of rough score card for grading. The ideas represented in the answers are given a weighting

which indicates the value placed upon that item in the answer when that idea is present.

TEST NO. I.

1. Hannibal—A Carthaginian general (3) who crossed the Alps (3) and marched against the Romans (4).
2. Khufu or Cheops—An Egyptian ruler (2) who built the pyramids (8).
3. Demosthenes—Famous Athenian (3) orator (5) who roused his people against Philip (2).
4. Darius—Persian ruler (2) who led an army against Greece (8).
5. Solon—An Athenian (3) law-giver (7).
6. Charlemagne—King of France (4) A Holy Roman Emperor (3) and a great educator (3).
7. Attila—Leader of the Huns (4) who sacked Rome (6).
8. Constantine—First Christian (6) Emperor (2) the founder of Constantinople (2).
9. Mithridates—King of Pontus (6) who massacred the Roman inhabitants of Asia (4).
10. Justinian—Emperor of the East (3) who persecuted the Jews and Arians (2) and codified the Roman laws (5).

TEST NO. II.

Any man mentioned as such in Myers' General or Ancient Histories.

TEST NO. III.

1. Battle of Tours—Decisive victory for Christians (6) and the stopping of the Mohammedan invasion (4).
2. Age of Augustus—Golden age (2) of literature (5) for Rome (3).
3. Battle of Milvian Bridge—Where Christianity was accepted (7) by Constantine (3).
4. The church council of Nicaea—Determination of orthodox Christian doctrines (10).
5. Check of the Saracens before Constantinople—Saved civilization (3) and made Europe Christian instead of Mohammedan (7).
6. Reign of Alexander the Great—Extension of European powers over Orient (6) and the awakening of the civilized world (4).
7. Age of Pericles—Golden age of Athens (5) supremacy of Athenian learning (5).
8. Founding of the Hebrew monarchy—Establishment of Christianity (7) and the separation of the Hebrews from Athens (3).
9. Burning of Carthage—Rome becomes a world power (7) through the downfall of her greatest enemy (3).
10. Peloponnesian War—Gave Sparta supremacy of Greece (7) through the defeat of the Athenians (3).

TEST NO. IV.

Graded by right and wrong cases; 5 points for each correct name in first and ten points each for correct answer in second part.

TEST NO. V.

Within ten years, 10 points; ten to fifteen years, 9 points; fifteen to twenty years, 8 points, etc., within the same century, 4 points; outside the century, 0.

TEST NO. VI. (Values not to be summated.)

1. Greeks—Culture (10), Art (5), Architecture (4), Literature (4), Philosophy and Science (4).
2. Teutons—Basis of civilization (10), Love of personal freedom (5), Respect for women (8).

3. Phoenicians—Alphabet (10), Commercial enterprise (10).
4. Saracens and Arabians—Science originating in Greece (10), Geometry and Algebra (10).
5. Romans—Law (10), Political interests (7), Military tactics (3).
6. Hebrews—Religion (10).
7. Persians—Satrapal form of government (10), Oriental customs (2).
8. Egyptians—Arts (8), Sciences (8) (both 10), Learning (3), Law (3).
9. Babylonians—Architecture (10), Literature and Religion (1), Science (3).
10. Prehistoric man—Fire (10), Language (10), Implements (5), Starting of civilization (2), Domestication of animals (8).

TEST NO. VII.

Correct classification, 10 points. (Since chance alone would give 33⅓%, these questions have all been eliminated from the calculations.)

TEST NO. VIII.

No score card devised and returns not yet employed in scaling.

Returns were secured from the complete surveys of the high schools of two large cities, two small ones, the random sampling of two other large ones and classes from two grades, Freshmen and Sophomores, in the University of Texas. A total of 933 papers were obtained filled out in acceptable form. These returns were graded by the score card and grouped on the basis of school, grade, and sex, though only the totals are employed in the calculations which follow. Grade and sex differences can be reported later.

The method of calculating and scoring was that used by most investigators along this line. The percentage of correctness in answering a question is assumed to be in inverse ratio to its difficulty, just as the percentage of those who spell a word is an inverse measure of its difficulty. This may not really be true in either case, but practically it is true, in that it measures the failure of present school methods to meet the situation, *i. e.*, it is a measure of inefficiency of the present methods of accomplishing the task. For present purposes the two are the same whatever might be the changed relation of difficulties and the new danger zones if teachers should begin to lay stress upon the points where deficiency is now apparent.

It was decided to use the Standard Deviation as the numerical measure for scoring the difficulty and arranging the questions on a linear scale. After calculating this standard deviation of 933 grades for some of the harder, some of the easier, and some near the median of the curve of difficulty and finding small difference, it was assumed that an average of those found would

closely approximate the average of all the sixty questions. This average was found to be 2.8. The probable error is negligible in this case.

TABLE I.

Showing Average Grades, Deviation from the Median, and the Derived Scale Values for Each of the Sixty Questions

	Test no.	Av. gr.	M. V.	Sc. Val.		Test no.	Av. gr.	M. V.	Sc. Val.
I	1	3!9	—.32	187	IV	1	2.14	+.31	250
	2	3.01	—.004	219		2	4.28	—.46	173
	3	4.9	—.68	151		3	1.66	+.48	267
	4	2.23	+.27	246		4	2.85	+.053	224
	5	2.9	+.04	223		5	1.59	+.5	269
	6	3.07	—.025	217		6	2.05	+.34	253
	7	2.91	+.032	222		7	4.35	—.48	171
	8	2.96	+.014	221		8	1.66	+.48	267
	9	1.4	+.57	276		9	1.92	+.38	257
	10	4.41	—.5	169		10	1.38	+.58	277
II	1	7.23	—1.5	69	V	1	3.4	—.14	205
	2	.82	+ .78	297		2	1.76	+.44	263
	3	1.13	+ .67	286		3	2.36	+.23	242
	4	5.59	— .92	127		4	.67	+.83	302
	5	6.17	—1.13	106		5	.73	+.81	300
	6	4.37	— .49	170		6	1.38	+.58	277
	7	7.83	—1.72	47		7	.88	+.75	294
	8	7.62	—1.68	54		8	1.24	+.63	282
	9	3.86	— .3	189		9	.7	+.82	301
	10	4.9	— .68	151		10	1.36	+.58	277
III	1	2.38	+.22	241	VI	1	5.73	—.97	122
	2	3.46	—.16	203		2	2.24	+.27	246
	3	1.59	+.5	269		3	4.65	—.59	160
	4	1.95	+.37	256		4	1.66	+.48	267
	5	2.43	+.2	239		5	2.55	—.91	128
	6	2.78	+.078	227		6	2.59	+.15	234
	7	3.16	—.057	213		7	2.03	+.34	253
	8	.59	+.86	305		8	2.83	+.061	225
	9	2.82	+.064	225		9	1.50	+.54	273
	10	1.38	+.58	277		10	2.77	+.08	227

By observation of the average grades as found in the first column of Table I it was also found that the median grade of difficulty would fall not far from an average grade of 3 points. This was taken as the true median. The method of scoring was as follows: Question I has an average grade of 3.9 or .9 above the median in grade, or for the sake of clearer English, below the median in difficulty. Dividing this differential by the average standard deviation we have —.32, an index of the distance below the median of difficulty at which question I is to be located. Similar calculations were made on each of the other fifty-nine questions and the results are shown in the second column (M

V) of Table I. These values show the distance of each of the questions above or below the median and what is of greater importance the distance of each from the others. This, however, is still indefinite until some established point of reference is found. An inspection of the rough average grades of 933 subjects on each of the sixty questions shows that to no one was there a universally correct response; *i. e.*, no question had zero difficulty. The nearest approach was Nos. II_7, II_8, and II_1 with averages 7.83, 7.62, and 7.23, respectively. These were then submitted as Nos. B, D, and H in the following list of ten easy questions:

A. Who were the people who lived in Egypt?
B. Name a man famed in ancient times as a general.
C. Was Julius Caesar a great man?
D. Name a man in ancient history famed as an orator.
E. Name a man mentioned in ancient history.
F. Name a city mentioned in ancient history.
G. On what river is Rome situated?
H. Name a man in ancient history famed as a ruler.
I. Was Alexander great?
J. What is the name given to the large structures near the Nile River in Egypt?

TABLE II.

Ranks of Difficulty Assigned to Questions A to J by Ten Judges

	1	2	3	4	5	6	7	8	9	10	Av.
A.....	2	8	5	8	6	9	9	8	3	4	6.2
B.....	7	4	7	7	2	7	7	5	5	6	5.7
C.....	1	6	2	2	4	5	1	3	1	3	2.8
D.....	10	9	9	5	10	6	6	6	7	7	7.5
E.....	5	1	1	1	1	2	3	1	4	1	2.0
F.....	4	2	3	6	3	3	4	2	8	5	4.0
G.....	9	10	8	9	8	8	10	10	9	10	9.1
H.....	8	3	6	4	7	4	8	7	6	8	6.1
I.....	3	5	4	3	5	1	2	4	2	2	3.1
J.....	6	7	10	10	9	10	5	9	10	9	8.5

These questions were submitted to ten competent judges who ranked them as to easiness, leading to ten judgments for each question. These rankings are shown in Table II. Standing out prominent in these judgments is the indication that question E is the easiest of the group. This list was also submitted to a class of 27 high school pupils who attempted to answer the question. It was found that question E was answered by all the pupils; *i. e.*, it has zero difficulty for them. While this does

not establish the fact, it is safe to assume that the difficulty of question E does not lie far from zero for any one who has really made a study of ancient history.

It will be remembered that questions B, D, and H in this supplementary list are identical with Nos. 7, 1, and 8 respectively in Test II of the original series. This was arranged so that a zero, if found at all, would be determined in such a way that its relation to the original questions might be established. By calculating the relation existing between the three known questions and the unknowns in the easy series one is able to place the zero question in relation to the original sixty, and thus to give an established zero of reference for all of them. The method for marking this calculation was as follows:

From Table II it is seen that,—

Three of the 10 judges rank D easier than B. (Both known.)

Two of the judges rank B easier than I. (One known).

Four of the ten judges rank I easier than E. (Both unknown.)

Then by using the standard deviation of the judgments on these questions as a measure of their difficulty, and interpolating those values already known the following equations are obtained wherein sigma (σ) signifies standard deviation in judgment of rank.

From D to B= $.84\sigma$—.22 units from median
From B to I= $.52\sigma$— X " " "
From I to E= 1.28σ— Y " " "

$$\sigma = \frac{.22}{.84}$$

$$.52\sigma = .52 \times \frac{.22}{.84} = .136 = X$$

$$1.28\sigma = 1.28 \times \frac{.22}{.84} = .335 = Y$$

Now since question "B" is known to be at —1.72 from the median (See Table I) it follows that question "I" is at the algebraic sum of —1.72 and —.136=—1.856. Likewise, question E is —.335 still farther down or at —2.191. This then establishes a zero of difficulty at a point 2.191 units below the median difficulty. Having this point of reference and correcting all values in Table I (M. V.) to read from zero instead of above and below the median, the values in the second column of Table I (Sc. Val.) are obtained and are expressed with decimal point moved two places to the right to avoid fractions.

TABLE III.

Showing Scale Values, the Intervals Between Established Points on the Scale and Subtotals to Facilitate Finding Desired Points

No.	Sc. Val.	Sc. Int.	Totals	No.	Sc. Val.	Sc. Int.	Totals	No.	Sc. Val.	Sc. Int.	Totals
E	0	0	0								
II 7	47	47	47	I 2	219	2	3231	V 2	263	6	8005
II 8	54	7	101	I 8	221	2	3452	IV 8	267	4	8272
II 1	69	15	170	I 7	222	1	3674	VI 4	267	0	8539
II 5	106	37	276	I 5	223	1	3897	IV 3	267	0	8806
VI 1	122	16	398	IV 4	224	1	4121	IV 5	269	2	9075
II 4	127	5	525	III 9	225	1	4346	III 3	269	0	9344
VI 5	128	1	653	VI 8	225	0	4571	VI 9	273	4	9617
II 10	151	23	804	III 6	227	2	4798	I 9	276	3	9893
I 3	151	0	955	VI 10	227	0	5025	III 10	277	1	10170
VI 3	160	9	1115	VI 6	234	7	5259	V 6	277	0	10447
I 10	169	9	1284	III 5	239	5	5498	V 10	277	0	10724
II 6	170	1	1454	III 1	241	2	5739	IV 10	277	0	11001
IV 7	171	1	1625	V 3	242	1	5981	V 8	282	5	11283
IV 2	173	2	1798	VI 2	246	4	6227	II 3	286	4	11569
I 1	187	14	1985	I 4	246	0	6473	V 7	294	8	11863
II 9	189	2	2174	IV 1	250	4	6723	II 2	297	3	12160
III 2	203	14	2377	VI 7	253	3	6976	V 5	300	3	12360
V 1	205	2	2582	IV 6	253	0	7229	V 9	301	1	12761
III 7	213	8	2795	III 4	256	3	7485	V 4	302	1	13063
I 6	217	4	3012	IV 9	257	1	7742	III 8	305	3	13368

Table III presents these values in the order in which they would appear on the linear scale. Subtotals are also shown to facilitate grading when the scale is used.

The method of using the scale is very simple in plan but somewhat burdensome in detail. Pupils are to be given the tests of the original in whole or in part and their work graded on the basis of 10 per cent. for each question. The score card will serve as a rough guide. The average, or median, for the class is then found for each question. This grade expressed as a fraction of a perfect grade is then multiplied into the scale value for the question. The sum of these products is the class grade in total scale points. For instance, if the scale grade of the class is 3.6 on question 10 of Test II its scale value is $.36 \times 151 = 54$. Similar calculations on each question give the total scale points achieved by the class. Now if the sum of these points is found to be 3200 by reference to the column of subtotals it is found that the class has advanced to a point on the scale between 217 and 219. The exact point may be found at 218.7 if absolute accuracy is desired. This scale point of any individual or class

means that the individual or class can answer perfectly the equivalent of all the questions below this point on the scale. If they really fall short of answering these easy questions perfectly they will answer more or less perfectly enough of the harder questions to compensate for the errors in the easier ones. Thus, the scale becomes a quantitative rather than a rigidly qualitative measure of ability in these particular aspects of ancient history. It can be made more qualitative by scaling each test separately. In its present form, however, it is comparable with many other scales which measure the amount of retention in a certain school subject after a certain amount of training in that field. It still remains to determine the qualitative and quantitative lapsing of historical information as one is further and further from a definite study in the field.

TESTS OF THE MEMORIES OF SCHOOL CHILDREN

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The present study of memory was concerned with the questions: 1. Does a child's memory improve with age? With grade in school? 2. Is any sex difference in achievement in memory present? 3. Do the sexes differ in variability?

Six hundred and thirty-eight children, of whom two hundred and eighty-five were boys and three hundred and fifty-three were girls, were each given six tests. The children were in twenty-two classes in the grades 4A through 8B in a large city public school. The following table (I) shows the number of subjects at each age in each grade.

TABLE I.

Age of Children in Each Grade

	4A	4B	5A	5B	6A	6B	7A	7B	8A	8B	Total
8.5....	14	1									15
9.5....	47	21	14								82
10.5....	20	32	32	23	8	4		1			120
11.5....	6	10	25	33	26	24	2	4			130
12.5....	2	3	12	11	15	18	11	14	11	3	100
13.5....	2	1	1	3	9	9	13	19	19	15	91
14.5....			1		2	4	4	12	18	21	62
15.5....			1	1	2		5	3	5	10	27
16.5....							1		2	6	9
17.5....										2	2
	91	68	86	71	62	59	36	53	55	57	638

Each subject was tested for the recall of words, recall of geometrical forms, recall of nonsense syllables, recognition of words, recognition of forms, recognition of nonsense syllables. One exception was that the children in 8A were not tested for the recall or for the recognition of nonsense syllables. There were boys and girls in all the twenty-two classes so that, although the directions were given twenty-two times, the conditions were the same for the boys and the girls. Each subject had his or her material so that any advantage or disadvantage due to his or her position in the room might be avoided.

The subjects knew there were to be twenty-five items of each material presented and that they were to be given fifty seconds in which to learn as many as they could. To give some idea how long the period of fifty seconds is, a large picture was shown for that length of time before the experiments were begun. This

also served to attract the attention and interest of the children. After they had seen the twenty-five items for fifty seconds, ten seconds elapsed and then they were asked either to write down the items seen (recall) or to mark each of the fifty which were then presented YES or NO according to whether or not they had previously seen them (recognition). For recall the score for each was the number of items correctly written, or in the case of forms,, drawn. For recognition, the formula suggested in Woodworth's laboratory outline was used, *i. e.*, score equals total number of items (in this case 50) minus twice the number of errors minus omissions, if there are any. Thus a perfect score for recall would be 25, for recognition 50.

Table II shows the average for the recall of words, forms, syllables and for the recognition of words, forms, and syllables for each grade. Table III shows the average for the recall of words, forms, and syllables for each age in the grades 4A through 8B. Children who have passed their eighth birthday but have not reached their ninth are called "8-year-olds" in this report; thus the average for "8-year-olds" is for age 8.5, for "9-year-olds," 9.5, etc. It should be noted that Table III does not indicate the average score for children eight years, nine years, etc., but for "eight-year-olds," "nine-year-olds," etc., as explained *in the grades* 4A, 4B, 5A, 5B, 6A, 6B, 7A, 7B, 8A, 8B of the school where the tests were made. There is a marked selection in the case of eight-year-olds, sixteen-year-olds and seventeen-year-olds. Only fifteen out of the 159 in the fourth year (4A and 4B) were eight years old, most of the children of that grade being at least nine years old. Due to the laws permitting children of 14 who have reached a certain grade to obtain their "working papers,"

TABLE II.

	Rc. Words		Rc. Forms		Rc. Syl.		Rg. Words		Rg. Forms		Rg. Syl.	
	Av.	P.E.	Av.	P.E.	Av.	P.E.	Av.	P.E.	Av.	P.E.	Av.	P.E.
4A....	4.22	.12	3.40	.12	1.79	.17	21.91	.78	7.98	.54	7.87	.53
4B....	4.94	.16	3.48	.13	1.69	.09	21.09	.99	7.72	.54	6.87	.66
5A....	5.43	.15	4.15	.12	1.79	.12	26.19	.90	10.09	.52	10.51	.58
5B....	5.63	.15	4.33	.15	2.20	.13	25.08	.80	9.10	.54	9.81	.71
6A....	5.92	.21	4.73	.16	2.16	.13	28.71	1.09	12.77	.65	15.82	.69
6B....	6.44	.15	5.24	.17	2.08	.11	31.10	.86	13.22	.66	12.86	.63
7A....	7.03	.27	4.97	.24	2.36	.17	28.83	1.16	8.28	.80	11.64	.97
7B....	7.75	.23	5.96	.17	2.74	.15	28.59	1.05	10.19	.64	12.51	.89
8A....	7.62	.22	5.40	.17			29.20	1.07	11.87	.76		
8B....	7.39	.20	5.37	.16	3.07	.17	30.82	.95	11.48	.71	14.74	.83

to the fact that most children of 16 and 17 have completed grade 8B, and to other causes, only 11 children of 16 and 17 were among the subjects in the 7th and 8th grades (7A, 7B, 8A, 8B).

Diagrams I, II, III, IV show graphically the results given in Tables II and III. For recall and for recognition according to grade there appears to be a slight general tendency toward improvement from the lowest grade to the highest, the lowest average score, however, is not always at 4A nor the highest at 8B. An inspection of the curves (Diagrams III and IV) for recall and recognition according to age within the grades shows a general tendency toward improvement from 9.5 to 15.5 years, regardless of grade within the range 4A through 8B. Since the curves for grade tend to show an improvement with grade and curves for age tend to show an improvement with age, it is possible that both grade and age have their influence. This leads to the questions: Do the youngest children in each grade have the best or worst scores? Do the oldest children in each grade do best or worst? Do those children whose age is the same as most of the other children in their grade have the best, medium, or worst scores?

The following method of scoring was adopted. One step in age was one year, 8 to 9, 9 to 10, etc., and for grade the step used was one year, 4 to 5 (4A, 4B), 5 to 6 (5A, 5B), 6 to 7 (6A, 6B), 7 to 8 (7A, 7B), 8 to high school (8A, 8B). If one adds the attendance in the A and B classes as given in Table I, and calculates the median one finds for Grade 4 it is at age 9.5, for Grade 5 at 11.5, for Grade 6 at 11.5, for Grade 7 at 13.5, for Grade 8 at 14.5. Turning to the scores for the recall of words, let us add the total scores of the nine-year-olds for Grade 4, of the eleven-year-olds for Grade 5, of the eleven-year-olds for Grade 6,

TABLE III.

		Rc. Words	Rc. Forms	Rc. Syl.	Rg. Words	Rg. Forms	Rg. Syl.
No. of Subjects	Age	Av.	Av.	Av.	Av.	Av.	Av.
(15)	8.5	(4.60)	(3.27)	(1.00)	(18.13)	(5.40)	(9.87)
82	9.5	4.70	3.36	1.68	21.49	8.70	7.49
120	10.5	5.41	4.10	1.86	24.94	9.65	9.56
130	11.5	5.56	4.54	2.03	25.87	11.08	11.17
110	12.5	5.85	4.64	2.28	26.08	9.55	11.16
91	13.5	7.16	5.33	2.38	29.54	9.56	11.77
62	14.5	7.19	5.51	2.86	31.24	12.58	13.23
(27)	15.5	8.33	5.41	1.91	35.39	10.26	14.32
(9)	16.5	(6.11)	(5.11)	(1.43)	(24.55)	(9.11)	(6.67)
(2)	17.5	(10.00)	(6.00)	(5.00)	(39.00)	(11.00)	(15.00)

of the thirteen-year-olds for Grade 7, and for the fourteen-year-olds for Grade 8. We should then have the total score of those who were in a grade where the median age was their age. Dividing by the total number of persons whose scores have been added, we have the average score for the children who were in a grade where the median age was their age. Then let us find the scores of those who were one year, two years, etc., older and one year, two years, etc., younger than the median age for their grade. Thus our tabulation for the recall of words is:

TABLE IV.

Scores

—3	—2	—1	0	1	2	3	4
		69	320	225	74	23	9
	65	324	304	132	22	7	13
		79	305	194	115	39	15
11	40	181	252	115	60	8	
	114	257	285	127	47	20	
11	219	910	1466	793	318	97	37

Subjects

—3	—2	—1	0	1	2	3	4
		15	68	52	16	5	3
	14	55	58	23	4	1	2
		12	50	33	18	6	2
1	6	25	32	16	8	1	
	14	34	39	15	8	2	
1	34	141	247	139	54	15	7
Average..... 11.00	6.44	6.45	5.93	5.70	5.88	6.47	5.30

Calculations for all of the six tests show the following results:

TABLE V.

	—3	—2	—1	0	1	2	3	4
Rc. Words.....	11.00	6.44	6.45	5.93	5.70	6.47	6.47	5.30
Rc. Forms.....	6.00	5.36	4.87	4.51	4.45	4.60	4.60	3.57
Rc. Syl.....	0	2.65	2.49	2.26	2.19	2.87	2.87	2.43
Rg. Words.....	44.00	25.38	26.71	26.55	24.76	29.13	29.13	31.85
Rg. Forms.....	16.00	10.50	10.58	10.53	8.61	11.67	11.67	7.71
Rg. Syl.....	12.00	13.74	12.66	10.73	10.17	9.69	6.07	9.57

The score under zero is that of the children who were in a grade where the median age was their age, under —1 is that of the children who were one year younger than the median, under 1 is that of the children who were one year older than the median for their grade and so on.

It is evident that the oldest children in a grade on the average do not have the best scores, but they do not always have the

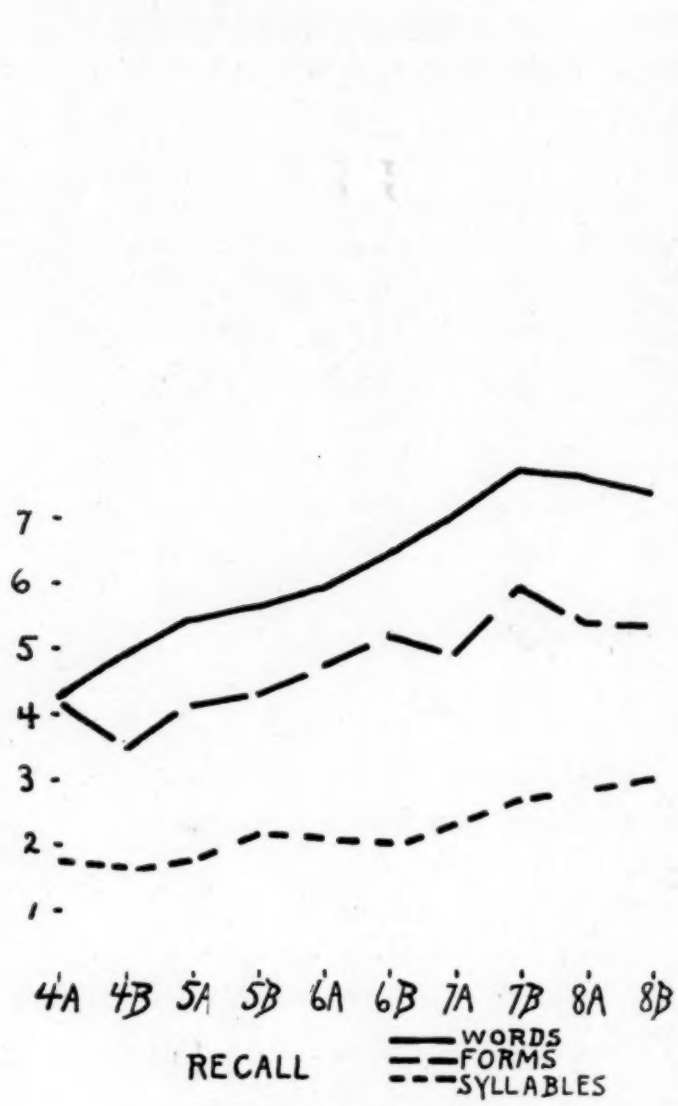


DIAGRAM I (See Table II)

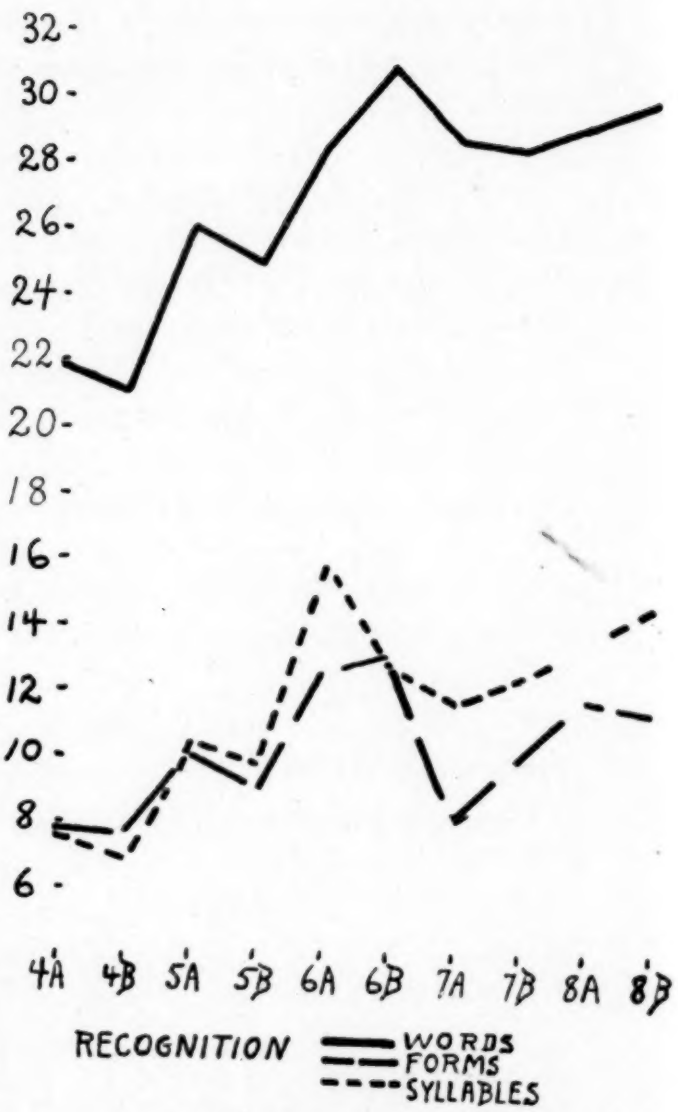


DIAGRAM II (See Table II)

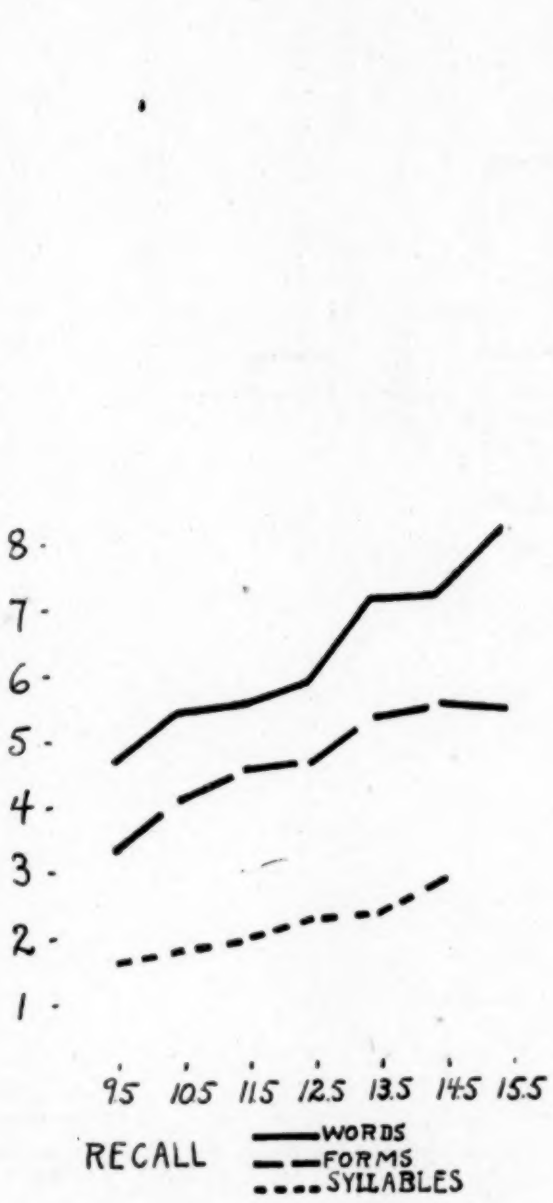
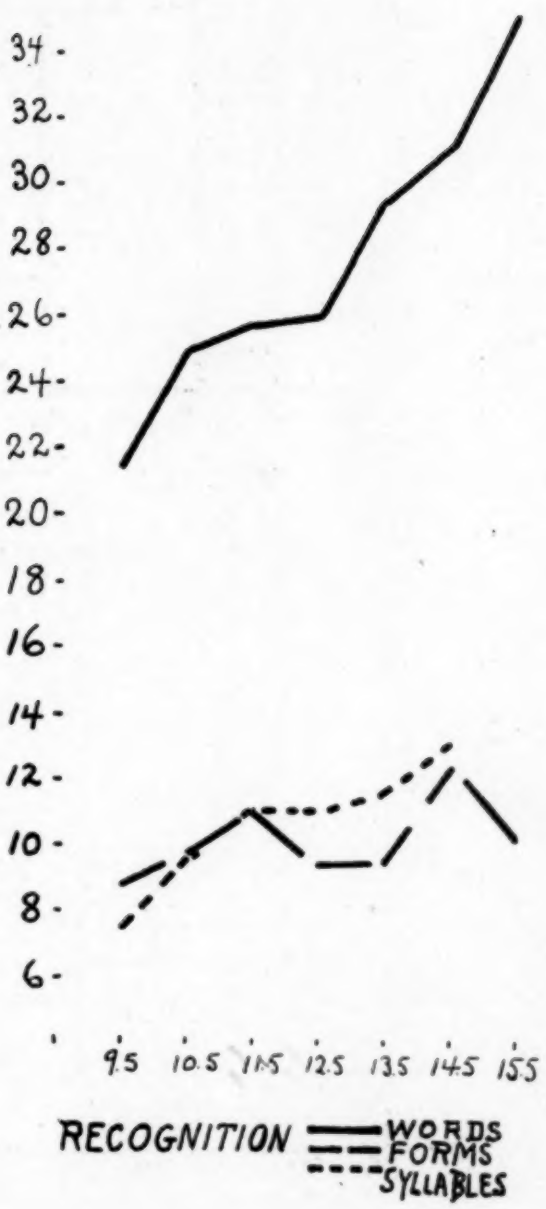


DIAGRAM III (See Table III)



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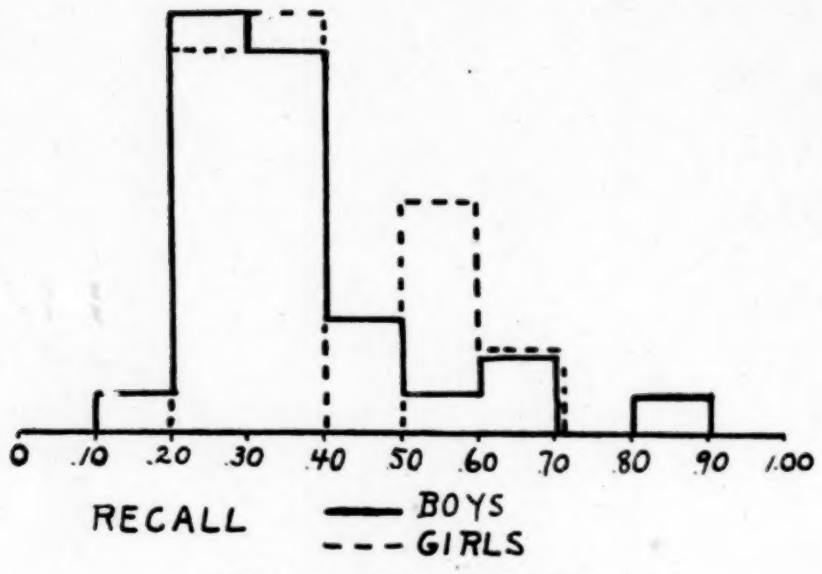

DIAGRAM V (See Table VI)

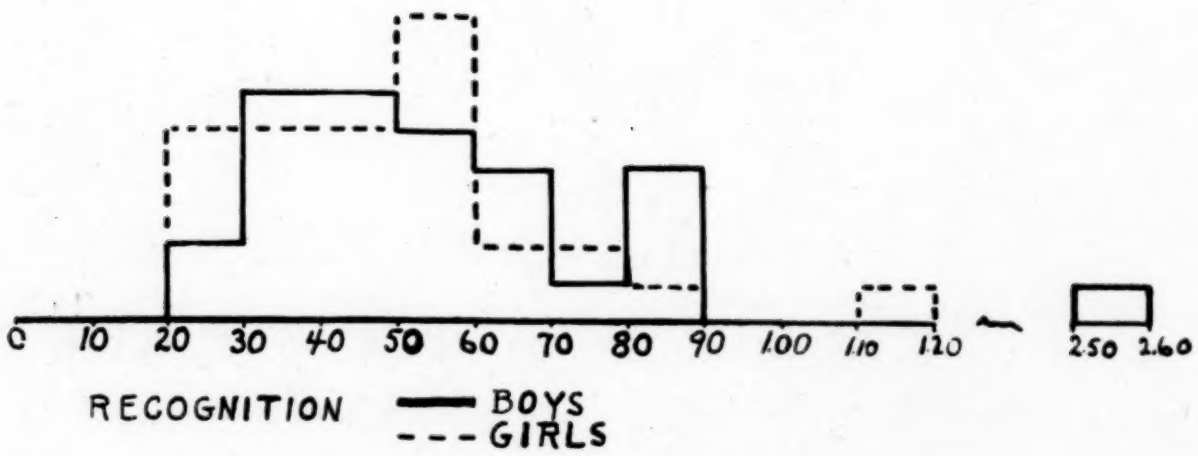

DIAGRAM VI (See Table VI)

TABLE VI.

Grade	Sex	Recall Words Av.	P.E.	P.C.	Recognition Words Av.	P.E.	P.C.
4A	B	4.12	.18	.3301	20.15	1.18	.4427
	G	4.30	.17	.3279	23.36	.97	.3485
4B	B	4.41	.20	.2925	14.79	1.35	.5842
	G	5.33	.23	.3246	23.32	1.34	.4250
5A	B	5.18	.21	.3050	23.74	1.24	.3863
	G	5.64	.22	.3103	28.19	1.15	.3303
5B	B	5.66	.19	.2544	23.88	1.18	.3744
	G	5.60	.24	.2750	26.73	1.18	.2858
6A	B	5.69	.30	.3198	29.38	1.27	.3261
	G	6.08	.26	.3076	28.22	1.39	.3250
6B	B	6.36	.23	.2013	24.45	1.45	.3292
	G	6.49	.19	.2182	35.04	1.05	.2226
7A	B	6.48	.34	.3114	27.12	1.43	.3119
	G	7.36	.42	.2269	32.73	1.87	.2215
7B	B	8.18	.34	.2298	24.04	1.11	.2558
	G	7.45	.32	.2847	31.81	1.34	.2785
8A	B	6.86	.29	.2274	29.62	1.29	.2366
	G	8.09	.28	.2410	28.94	1.43	.3417
8B	B	6.63	.35	.2338	27.68	1.19	.3555
	G	7.76	.30	.2332	32.39	.95	.2146

Grade	Sex	Recall Forms Av.	P.E.	P.C.	Recognition Forms Av.	P.E.	P.C.
4A	B	3.32	.17	.3916	7.56	.83	.8307
	G	4.30	.19	.3279	8.16	.71	.7328
4B	B	3.69	.23	.3225	8.10	1.03	.8136
	G	3.33	.15	.3273	5.36	.83	1.1567
5A	B	4.26	.20	.3451	11.15	.81	.5399
	G	4.15	.16	.3084	9.21	.67	.5094
5B	B	4.59	.21	.3508	9.73	.82	.6362
	G	4.00	.21	.3250	8.23	.83	.5747
6A	B	4.42	.24	.3303	11.88	.83	.4192
	G	4.95	.20	.2869	13.47	.95	.4996
6B	B	5.27	.22	.2941	10.36	1.13	.6071
	G	5.22	.22	.3027	14.92	.78	.3807
7A	B	5.08	.14	.1673	8.36	.58	.4103
	G	4.55	.46	.3956	8.09	1.09	.5266
7B	B	6.23	.21	.2071	9.77	.93	.5281
	G	5.77	.25	.2894	10.48	.83	.5248
8A	B	5.43	.24	.2431	12.14	1.01	.5461
	G	5.38	.23	.2918	11.71	.97	.5730
8B	B	5.63	.23	.2096	14.61	1.14	.4031
	G	5.24	.21	.2863	11.48	.87	.5523

Grade	Sex	Recall Syllables Av.	P.E.	P.C.	Recognition Syllables Av.	P.E.	P.C.
4A	B	1.54	.12	.6101	6.95	.81	.8777
	G	2.00	.15	.6200	8.62	.85	.8260
4B	B	1.51	.11	.4702	2.45	.97	2.5266
	G	1.82	.15	.5989	10.26	.89	.6404
5A	B	1.74	.19	.8218	7.34	.84	.8465
	G	1.83	.14	.6393	10.68	.78	.6403
5B	B	2.27	.18	.6123	9.98	.98	.7405
	G	2.10	.17	.5650	9.60	1.08	.7281
6A	B	1.81	.17	.4144	15.81	1.07	.4080
	G	2.41	.19	.5560	15.83	1.16	.4068
6B	B	1.86	.17	.5000	11.41	.88	.4294
	G	2.21	.16	.5112	13.19	.88	.4784
7A	B	2.24	.10	.2679	11.24	1.16	.6112
	G	2.64	.26	.3902	12.55	1.77	.5546
7B	B	3.00	.23	.3933	10.32	1.11	.5978
	G	2.55	.22	.5255	14.06	1.26	.5925
8B	B	2.84	.24	.4331	10.79	1.36	.6525
	G	5.37	.37	.5028	16.71	.98	.4261

worst scores. The children at the median age for their grade do not have the best nor the worst scores. There is a tendency for the scores of those who are younger than their classmates to be higher, except in the case of syllables, but the number of subjects is small for —3. The curves and these data suggest that there is a tendency toward improvement by age and by grade, but especially by age.

In Table VI are given the averages for each sex in each grade. If the averages are averaged, the following table (VII) is obtained:

TABLE VII.

	Boys	Girls	
Recall Words	5.96	6.41	G>B by .45
Recall Forms	4.76	4.69	G>B by .10
Recall Syllables	2.09	2.55	G<B by .46
Recog. Words	24.49	29.07	G>B by 4.58
Recog. Forms	10.37	10.11	G>B by .26
Recog. Syllables	9.59	12.61	G<B by 3 02

In four cases out of the six the girls were on the average better than the boys. Earlier investigators have said that girls were superior to boys in recall, but their interpretations of their data have not always seemed warranted. Chamberlain found no sex difference.

Table VI gives the variability of each sex in each grade for the six tests. The measure of variability here used is the gross variability divided by the average, known as the Pearson Coefficient of Variability.

In recall of words the variability for girls is greater than for boys six times out of ten; in recall of forms six out of ten; in recall of syllables seven out of nine; in recognition of words two times out of ten; in recognition of forms five times out of ten; recognition of syllables once out of nine times. Of the fifty-eight coefficients of variability 27 show greater variability for girls and 31 show greater variability for boys. As the diagrams (V, VI) indicate, no marked sex variability in memory tests is apparent.

Summary

1. A child's memory seems to improve by age and by grade, possibly more by age.

2. For the memory of words and syllables the averages are slightly higher for the girls, for forms slightly higher for boys.

3. There appears to be no marked difference in sex variability.

ALLEGED ELEMENTS OF WASTE IN LEARNING A MOTOR PROBLEM BY THE "PART" METHOD[1]

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Whole method procedure demands the continuous repetition of an entire body of material until the desired stage of mastery is attained. Part procedure demands an initial mastery of of definite sections of the material and the final connection of these different sections in proper serial order. These two methods have been employed at length for investigating the learning of logical material (both prose and poetry) and also for nonsensical material. Although the various psychologists of the German, French and English laboratories have scarcely been uniform in their definition and use of the "part" method, nevertheless their results have been very uniform and accepted as conclusive. Consequently, it seems established that the "whole" method of learning is far more advantageous than the "part" method, both for speed of learning, more correct formations of associations, and more permanent retention. But the motor field of learning has not been given the same degree of attention showered upon rote and logical materials. This paper directs attention to the motor field.

Learning the maze is a type of motor problem that affords splendid opportunity for testing and comparing the whole and part methods. It is a problem whose general nature can be easily mastered, but which at the same time requires many trials and high energy expenditure for the setting-up of the many associations demanded. The cul de sacs, retracing opportunities, etc., offer many chances for error, all of which can be readily noticed and recorded by the experimenter. Also, there is no question as to when the problem is completely mastered by the various subjects, a nicety scarcely possible in the oral repetition of a long body of nonsensical material. Finally, the maze problem better than any other gives an opportunity for comparing the learning behavior of humans and lower animals when learning conditions are made identical.

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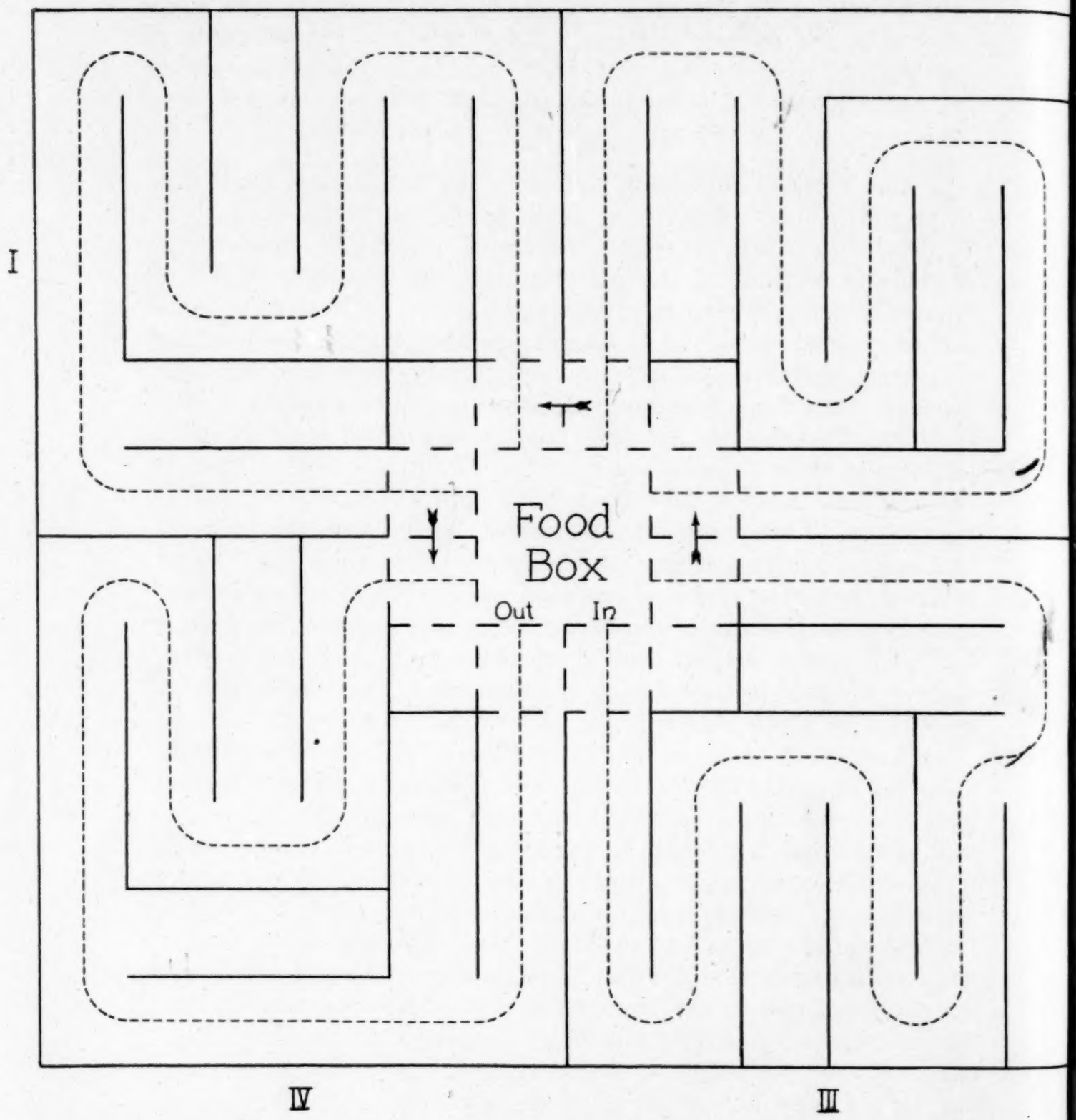
[1] Read at the annual meeting of the American Psychological Association, Dec. 27–30, 1916.



A maze for testing learning by "whole" and "part" methods. Each of the four sections has an indep entrance and exit at the common center. The course of the true pathway is represented by a dotted runnin Dotted lines across the pathways represent removable panels. By means of these, it is possible to arrange th so that the maze can be learned as a whole; in parts later to be connected; forwards or backwards, etc. The re ular areas around the center form a distributing gallery, by means of which the runner may pass from one sec some section not adjacent, *e. g.*, I–III.

The accompanying diagram represents a maze admirably suited for whole-part testing. There are four distinct parts or units to the maze, each possessing the same number and type of cul de sacs, the same linear distance in the true pathway, entrances and exits into a common open place, etc. By the removal of sliding panels, the maze can be learned as a whole or separately learned parts easily connected. Consequently, learning this maze is highly comparable to learning such material as a poem or a nonsensical series, where the sections are equated for length, and where the material may be learned as a whole, in parts or in any desired combination of parts.

The maze for the humans was constructed out of a cast brass plate, the true pathway and cul de sacs being represented by grooves. The maze was kept under screen and the subject, by placing his arm under the screen, learned the true pathway by traversing the grooved course with a pencil. Herein he was forced to rely solely upon the tactual-kinaesthetic avenues for data gathering. The maze was duplicated in every particular for animal learning, the animal maze being of the type common to the animal laboratories. Rats were used for this phase of the experiment. Though not deprived of vision (as was the case with the human subjects), the learning conditions for the rats are highly comparable to those of the human, as the rats have been shown to rely mainly upon the tactile-kinaesthetic sensory systems in mastering a maze area.

College students from the classes in Introductory Psychology were used as subjects. Each learner was assigned either the whole or some part method and given two trials in succession each day until the problem was mastered. The number of cul de sacs entered while going forward, those entered while returning toward the entrance, and the number of sections of the return path traversed were recorded as three different types of errors—A, B, and C. These, together with the time of each run and the number of trials required for complete mastery, constitute the data upon which the subsequent generalizations are based. Each rat was given two trials per day and the learning data secured as in the case of the humans.

Humans and rats agree in finding the whole method far more efficient, especially when no more retracing is allowed than is possible in part learning. For the humans, the whole method

shows an advantage of 26, 126, and 195% respectively, for the number of trials, time and errors. In the case of the rats, there is neither advantage nor disadvantage for the number of trials, but there is decided advantage of 13 and 44% respectively, for time and errors. Consequently, insofar as the maze type of learning can be taken as typical, it is conclusive that the pure part method of learning is non-efficient in the motor field, thus duplicating the results established for verbatim learning.

TABLE I.

Whole and Part Methods in Maze Learning

Method	No. of Individuals (Humans)	Trials	Time	Errors A	B	C	Total
Whole							
—Returns Allowed..	6	12	641″	16	13	97	126
Returns Prevented..	6	17	541	23	6	52	81
Part							
—Pure Part.....	6	23	1220	36	25	176	237
Progressive.....	6	10	352	10	3	44	57
Direct Repetitive....	6	11	618	15	11	70	96
Reversed Repetitive.	6	22	1014	27	24	175	226

Method	No. of Individuals (Rats)	Trials	Time	Errors A	B	C	Total
Whole							
—Returns Allowed..	12	27	4174″	54	24	139	217
Returns Prevented..	9	30	1666	56	4	51	111
Part							
—Pure Part.....	9	30	1907	74	17	108	199
Progressive.....	9	11	662	39	2	24	65
Direct Repetitive....	11	21	1442	45	9	88	142
Reversed Repetitive.	8	17	882	22	5	49	76

Tables to show the averages of human and rat groups in learning a maze by whole or part methods. The first whole method permits unlimited returning; the second allows no more retracing than is normally possible in the pure part method. The various part methods differ regarding the time and manner of the act of connection.

The elements of waste in part learning demand isolation. Several hypotheses are open for testing. In the first place, the high error and time scores in part learning may be due to the fact that learning the first motor units renders the mastery of the subsequent ones more difficult. This condition may be termed *negative transfer*. If control groups of learners are taught either units II, III, or IV and these scores formulated in ratio with the results of the part learners for the particular section, the strength of the negative transfer is easily measured. But such a comparison reveals that the part learners were not handicapped by having mastered earlier units but were materially aided. For

the humans there was a positive transfer of 2.3, 46, and 70% for sections II, III, and IV; for the rat situation, 43, 47, and 9% respectively.

A second hypothesis is that the waste is due to disintegration through time. Considering the fact that only two learning trials were given per day, quite a significant time interval elapses between the time the first units were learned and until they are again traversed in the final act of connection. For the humans, this time interval averages 13, 8, and 5 days for sections I, II, and III respectively, and 15, 11, and 4 days respectively, for the rats. When new learners are taught a single section and allowed to rest for the same interval that the part learners established, and the disintegration of the motor habit measured by the relearning expenditure, the disintegration is shown to be practically nothing. Most of the subjects retained a complete control over the activity and only showed a slightly slower speed for the first relearning trials.

A third hypothesis is that of retro-active inhibition. Perhaps learning the later units unseats the habits earlier set up. Specifically, does the part learner have a control over each unit when he again faces them in the complex act of final connection? New groups of subjects were taught all the motor units as for part learning, but were then not given the connecting trials. Instead, they were retrained upon unit I. This relearning expenditure is the measure of the retro-active effect exerted upon unit I because of having learned units II, III and IV subsequently. But the groups displayed almost perfect control over unit I. When retrained upon the remaining units, the identical retention of skill was shown. Consequently, it was clear that retro-active inhibition is to be disregarded as an explanation of why the part learners fail in the complex act of connection.

A fourth hypothesis is that of contiguity of unit functioning. The three earlier tests have shown that all the units can function perfectly as units, provided that a considerable time interval (24 hours) is allowed between tests. But in the final stage of part method learning, the units are forced into a contiguity of functioning. Does this cause the control over the units to be lost? Perhaps there is marked interference between the several acts if contiguity of functioning is required. To test this hypothesis, new groups were taught the four units and thereafter given

an opportunity not to connect the units but rather to have a single trial in various combinations of the units. For example, the task of the day might call for running the units *as units* in the order that completely reversed the learning conditions, namely,—IV, III, II, I. Since all the entrances and exits were from a common center, this was easily rendered possible. In no case did the groups average higher than $^{2}/_{5}$ths errors per day. The subjects showed almost constant ability to adjust to changing requirements day after day, hence showing that the part learner has absolute control over all the units he has mastered, so long as these are kept as units.

A final hypothetical cause of waste is that of unit incompatibility in a larger series. Perhaps no unit can continue to function as a specific part of a bigger motor situation. Perhaps the many trials of connection suffice for uprooting the *unit* habits and establishing a single, comprehensive habit. But this is an extravagant assumption, as shown by the present test. The maze employed may be so adjusted as to compel the subject to run the problem as a whole, to run any part of it, or to eliminate certain unit areas and leave the beginning and terminal areas still in the act. Both humans and rats show an amazing accuracy in accommodating to such changes, whether these be in combinations I to III, II to IV, or apparently the most difficult one possible, namely IV to I. This warrants two conclusions, —that a motor unit can function as such, provided it is part of a larger whole; also, that no incompatibility between specific parts exists in the motor problem.

These five tests emphasize the necessity of excluding as factors of waste in part learning whatever refers to the mastery of the several units or the interrelationship between these units. To the writer, therefore, it seems apparent that all the waste in part learning occurs in the act of connection and is here traceable almost entirely to the influence of place association.

Place association refers to the definite location of an element of a problem in reference not only to the remaining details of that problem but to the entire environment. Waiving a demonstrable comparison between the case of rote learning and a motor problem of the maze type, (so far as each involves place association), attention may be directed to the types of positional relationships established in the motor problem now under dis-

cussion. These are temporal and spatial. A constant short time span for each unit means to the subject a cessation of the running and the substitution of some other desired activity. No doubt each critical turn of the course gets itself located in the entire time span just as definitely as a term is located in a series of nonsensical syllables. Again, a definite distance traversed comes to mean cessation of the running activity. Finally, each turn, cul de sac, and section of the true pathway becomes positionally established with reference to many aspects, *e. g.*, the opening into the food-box, the starting place, the position of the experimenter, etc. These positional establishments (the necessary by-products in the mastery of each unit) seem to demand breaking up when the units are being connected. Herein is assigned the waste in part learning.

Evidence for this may be drawn from three sources. In the first place, the behavior in the initial act of connection shows, by the constant returning to the starting place, the delay at closed exits, the hesitation, confusion, discouragement, etc., etc., that the runner is vainly relying upon short time and distance relationships to bring the changed activity previously secured. In the second place, the evidence produced by the tests earlier discussed argues for this hypothesis of place association. Here it was shown that all the units could function perfectly as units and that any part of a greater whole could function perfectly. In neither such case are the positional establishments destroyed. But a third line of evidence is experimental. Here this question must be answered: If the act of connection is controlled, cannot the learner be made to eliminate the positional factors while these are few and not deeply entrenched? To test the matter, several modified "part" methods were utilized. Space permits only a detailed discussion of the "progressive part" method.[2] Herein the subject learns the first two units as units and proceeds at once to the act of connection. Then Section III is mastered as a unit. This is immediately joined to the I–II unity previously established. Section IV, learned and connected, completes the entire series. The results are astounding. Both humans and rats master the

[2] For a detailed discussion of the several methods, see Pechstein, L. A. Whole vs. Part Methods in Motor Learning. A Comparative Study, Psychol. Rev., Mon. Supp., Vol. XXIII, No. 2, 1917.

problem with scores far superior not only to those secured by the pure part method but especially to those made by the whole method. Also, this superiority is recorded by all types of measuring criteria, both time, trials and total errors. Moreover, the demonstrated superiority of this "progressive part" method is illustrated as well by several other modifications of the pure part method. All such methods set up positional relationships when the separate units are being mastered, but they demand a steady and progressive elimination of these. Upon the distributive handling furnished the positional factors, does much of their value rest.

Yet it seems reasonable that any progressive handling of the positional factors should be expected merely to cause the scores of the modified part methods to approach as a limit the much advertised attainments of whole method learning. But their demonstrated superiority certainly commands attention. There are certain inherent elements of strength to part method learning, to which time denies a discussion in this paper. These inherent advantages, taken in conjunction with the progressive and distributive handling of the positional factors, explain the superiority of the modified part methods over the whole method.

These remarks are meant to apply to that field of motor learning represented by the maze. However, the demonstrated advantages operating herein lead the writer to question a thorough-going statement of the superiority of the whole method in the fields of verbatim learning until the results of certain modified forms of part learning have been obtained and found inferior.

ABSTRACTS AND REVIEWS

RECENT PUBLICATIONS IN HISTORY

1. W. C. Bagley and H. O. Rugg. *The Content of American History as Taught in the Seventh and Eighth Grades.* University of Illinois Bulletin, Volume 13, No. 51, August 21, 1916. Pp. 59.

2. W. C. Bagley. *Present Day Minimal Essentials in United States History as Taught in the Seventh and Eighth Grades.* The Sixteenth Yearbook of the National Society for the Study of Education. Part I. Second Report of the Committee on Minimal Essentials in Elementary School Subjects. 1917, pp. 143–155.

3. Ernest Horn. *Possible Defects in the Present Content of American History as Taught in the Schools.* The Sixteenth Yearbook of the National Society for the Study of Education. Part I. 1917, pp. 156–172.

4. B. R. Buckingham. *Correlation Between Ability to Think and Ability to Remember, with Especial Reference to United States History.* School and Society. Volume V, April 14, 1917. Pp. 443–449.

5. Sarah A. Dynes. *Socializing the Child. A Guide to the Teaching of History in the Primary Grades.* Boston: Silver, Burdett and Company, 1916. Pp. x, 302.

6. Henry Johnson. *The Teaching of History in Elementary and Secondary Schools.* New York: The Macmillan Company, 1915. Pp. xxix, 497. $1.40.

With the present vigorous attack upon purely formal and disciplinary studies in both the high and the elementary school, the interest of educators is turning more and more to history as a content subject. The purpose of history is to bring the pupil to an acquaintanceship with the life of the past, in order that he may have a broader and better understanding of the various movements in the life of the present. How this aim is to be attained is receiving and should receive an increasing amount of attention. The two important questions involved are what shall be taught and how shall it be taught.

Undoubtedly the most important factor in determining what is taught in American schools is the text-book used, and the monograph of Bagley and Rugg (1) is an analysis of the subject matter contained

in typical history text-books published between 1865 and 1912. These texts, twenty-three in number, are divided into four classes, representing the years 1865–1874, 1881–1888, 1890–1904, and 1906–1912. There is little uniformity in the topical arrangement of the material in these texts, the number of periods varying from four to fifteen according to the individual whim of the author. The books of the more recent classes show a distinct improvement in the number and accuracy of bibliographical references, inserted either at the close of the sections or at the end of the book. Another characteristic of the more recent histories is the use of problem questions to stimulate the reflection of pupils. A noteworthy increase in the length of the more recent texts is also recorded.

Considering American history as made up of nine periods, a comparison of the different groups of texts is made from the point of view of the amount of space devoted to each period. The most striking change in treatment is found in the period 1783–1812 which increases from 6.4 per cent. in the earlier texts to 14.17 per cent. in the later ones. There is a significant decrease in the space devoted to colonial development, the Revolution, and the Civil War, while the periods of Discovery and Exploration, 1812–1861, and 1865 to the present show slight increases. It is clear that the tendency is to give greater attention to political, economic and social development and devote less space to military affairs.

The final chapter deals with what the authors call "The Hall of Fame," that is, the frequency with which public men are mentioned in school text-books. Of those most prominent in civil life, Lincoln heads the list and if we take his frequency as 100, Washington comes next with 84, Jefferson 82, Jackson 49, John Adams 46, and Madison 40. In military affairs Washington heads the list, and with him as the basis of comparison, R. E. Lee comes next with 83, Grant 76, W. T. Sherman 48, Cornwallis 42, McClellan 41. The study is an important contribution to the understanding of the contents of history text-books, and marks a distinct step forward in our study of the teaching of history.

In a second paper (2) Professor Bagley gives a detailed list of the topics treated in the twenty-three elementary texts studied. In this analysis the topics found in all of the texts are printed in small capitals, those found in three-fourths of the texts in ordinary type, and those found in a smaller number of texts but that have a considerable importance are enclosed in parenthesis. In addition to these topics

the list includes the most important names found in elementary histories. Topics recommended by the Committee of Eight are indicated by asterisks. While the mere fact that a topic or name appears in a text is not sufficient reason for recommending the study of that topic to pupils, the consensus of opinion indicated here presents a very good starting point for the determination of minimum essentials in United States history.

The statement is frequently made that "the chief purpose of teaching history in the elementary school is to make pupils more intelligent with respect to the crucial activities, conditions and problems of present day life." Dr. Horn (3) made this the starting point of an investigation to determine what topics of historical nature were dealt with in representative books of political, social and economic affairs. The heads of the departments of political science, sociology and economics in the University of Iowa made out lists of problems of vital interest at the present time and made note of the books in which the best treatment of these problems was to be found. This resulted in a total of twenty-seven books and thirty-eight topics. These books were then subjected to a detailed examination for the dates most frequently mentioned, the periods of American history referred to, the phases of history involved, and the persons whose names occurred most frequently. It is interesting to note that of the twenty-six dates listed but a single one occurs in Professor Bagley's list compiled from the history texts. Such dates as 1492, 1607, 1765, 1812, 1861, were practically never found in the books and articles examined. The dates most frequently found were 1900 (one hundred fourteen times, in connection with twenty-two different problems), 1890 (eighty four times, with twenty problems), 1850 (fifty-six times, with fifteen problems), 1870 (fifty-three times, with twenty-one problems), 1830 (fifty-two times, with eight problems), and 1893 (fifty-two times, with sixteen problems). More than eighty-five per cent. of the references fell within the period 1861 to 1916, while in the case of the elementary text-books examined only twenty-four per cent. fell within that period. In the books on modern problems eighteen per cent. of the references dealt with political history, four per cent. with military, and seventy-eight per cent. with social and economic questions, while the texts showed forty-two per cent. political, forty per cent. military, and eighteen per cent. social and economic.

Of the persons mentioned Roosevelt heads the list with a score of two hundred eighty-four, Adam Smith comes next with two hundred

fourteen, J. S. Mill with one hundred seventy-four, Malthus with seventy-four, and Napoleon with sixty-four. Washington comes eleventh with twenty-nine, Jefferson fifteenth with twenty-four, Grant sixteenth with eighteen, and Alexander Hamilton twenty-eighth with a score of nine. It is obvious that there is no great agreement between the points emphasized in elementary history texts and those found in current discussions of social and political problems. Whether there should be any extensive agreement is a question which would afford material for discussion.

In a study of the answers made by pupils (4) to different types of history questions Dr. Buckingham sought to determine the relationship that existed between the ability to answer thought questions and information questions. The information questions proposed were of the usual type of examination questions in history, while as thought questions problems like the following were presented: "In 1790 ninety per cent. of the people of the United States lived on farms. At the present time only thirty per cent. of the people live in the country. How can you account for the change?" The regression coefficient for information on thought was .16; that of thought on information was .89. This means that for each unit of information ability a pupil shows .89 of thought ability, but for each unit of thought ability there will be only .16 of a unit in memory. In other words the score made on information questions is a much better index of thought power than the score made on thought questions is an index of information.

Instead of relegating the study of history to the upper elementary grades and the high school Miss Dynes (5) proposes to begin the development of the historic sense in the first grade. To be sure she does not expect any formal history work to be done there, but rather through play, construction work, pictures and stories she would familiarize the child with his immediate social environment, such as the functions of the policeman, fireman, street cleaner, health officer, mail carrier, milk man, grocer, carpenter, plumber, the relations of the child to others in the home, and the advantages it derives from such public enterprises as systems of water works, parks, playgrounds, streets, schools, hospitals and homes for the friendless.

In Grade II the life of primitive man is taken up, the transition from tree dwellers to cave dwellers indicated, the uses and control of fire studied, and the further development of man in occupations, travel and transportation is outlined. Existing tribes of primitive

men as the Eskimos and the American Indians are described. Grade III studies the home life, customs, and distinguishing features of four representative civilized countries, Holland, Germany, Japan and France. There is a chapter on the telling of stories introducing Bible characters, heroes of Greece and Rome, and an extended study of Columbus. The author gives valuable lists of reference books for the teacher's use, and the work is so well planned that any elementary teacher should succeed in arousing great interest and building a valuable foundation for later systematic historical study.

In Professor Johnson's book (6) we have the most recent, the most incisive, and the most illuminating study of the teaching of history that has yet appeared. The first five chapters are devoted to the history of the teaching of history. The simple narrative and the moralist-didactic types of historical account characteristic of early civilization and still favored by many school masters, are contrasted with the modern scientific conception of history, in which an objective interpretation of social conditions is striven for. Of all the aims that have been proposed in justification of the teaching and study of history the most convincing and the only really permanent aim is to understand the world in which we live,—to make the social world intelligible. History, therefore, is to be studied for its own sake, and not for any factitious material, political or moral advantage which the disciplinary conception of history is prone to amplify. Chapters four and five contain a valuable brief survey of the place of history in school curricula from the sixteenth century to the present time, with especial reference to France and Germany and to the recent developments in this country. The value of the biographical approach to history receives due appreciation, and the proper use of models, pictures, maps, text-books and collateral reading receives careful and discriminating treatment. The chapter on the correlation of history with other subjects in the curriculum, as geography, literature and government, presents a sympathetic account of the various plans that have been proposed for relating history to other subjects, but concludes with an expression of doubt whether such schemes may not be detrimental to history itself as well as disorganizing for the other subjects. The author believes that it will be well to leave to literature the imaginative re-creation of historic characters, to treat the governmental organizations of today as contemporary social rather than historical phenomena, and to confine the history work strictly to the task of interpreting the past. In a final chapter on the history

examination the author deplores the emphasis placed upon the memoriter reproduction of isolated historical facts, and urges a type of examination which will show the pupils' ability to interpret and utilize historical materials, situations or generalizations.

The task of the teacher of history is thus conceived as making the past real. In the accomplishment of this all imaginable aids and devices are to be employed, and ample opportunity must be given to the pupil for the manifestation of that "self-activity" which Froebel conceived to be the very essence of the learning process.

J. C. B.

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EDITORIALS

THE HISTORIC SENSE

In discussing the aims of history study with teachers of that subject one frequently hears the statement, "I do not care to have my pupils learn dates and events, but I am particularly anxious to have them develop the historic sense." What is this historic sense? How can it be developed? These are questions in which the educational psychologist is interested, and which it is incumbent upon him to attempt to answer. An eminent university professor of history who was lamenting the failure of high school teaching to develop the historic sense was asked what he meant by the term. After some discussion in which it became clear that he was thinking primarily of graduate students, embryo historians, he appealed to the wide differences manifested by members of the same class, and of approximately the same training, in the ability to orient themselves to new historical material. If two students are given a number of newspaper files and are asked to write the history of a town for a five-year period, one will give a clear, intelligible, well-articulated account, with the various events and movements in due

perspective, with adequate emphasis on a few leading features and proper subordination of details, while the other will have merely a hodge-podge of miscellaneous facts. The one shows the historic sense, the other does not.

The same difference is noticed, though perhaps not so clearly, in a class of college freshmen, especially if the course makes extensive use of source materials. Some pupils show great skill in the orderly arrangement of their historical data, skill in seizing upon essential points of the narrative and keeping these well in the foreground of their thinking, skill in massing minor considerations to support their main positions. Others take all statements with equal emphasis, keep all parts of the discussion upon the same level, and become hopelessly confused in the multiplicity of details.

The historic sense thus seems to be akin to what the newspaper man has in mind when he talks about "a nose for a story." It is a specialized form of that general selective ability which Thorndike in a recent article has shown to be of such vital significance in reading. Erroneous replies to questions upon a printed passage are due to the over-potency or under-potency of certain elements in the passage, thus leading to distortion of the thought as a whole. Adequate comprehension of the passage depends upon such a balanced potency of ideas that there is a mutual inhibition to dominance in response until all the elements have had an opportunity to exert their influence upon the final judgment. If the passage is familiar or the sequence of ideas habitual, the significant elements flash quickly to the foreground of consciousness. If the train of thought is novel or the passage is involved, we have to pause, re-read, dwell upon each element, perhaps drop out certain qualifying phrases altogether, before we are satisfied as to the meaning.

In like manner the historic sense, the appreciation of historic values, depends upon such a balance of potency in the single elements of the thought that the minor elements are subordinated and the major elements stand out as high points in the total complex. But what determines this profile pattern into which the historic thought landscape falls? Practice, training are undoubtedly of the highest importance, but native mental organization also plays a considerable part. A fascinating field for investigation is here offered to the experimentalist to determine native differences in historic ability, and to ascertain the effects of specific courses of training.

J. C. B.

THE RELATION OF PSYCHOLOGY TO MILITARY PROBLEMS.

Psychology, like other branches of science, is represented in the organization of the National Research Council by a committee whose purpose is to stimulate and coördinate investigation within its appropriate field that may develop methods or supply information of value to the military activities of the United States. This committee comprises Dr. Yerkes, Chairman; and Drs. Cattell, Dodge, Franz, Hall, Thorndike, Seashore, Watson, Whipple.

Other committies have been appointed by the Council of the American Psychological Association, as follows:

On psychological literature relating to military affairs. Chairman; Dr. Bentley.
On the psychological examining of recruits. Chairman; Dr. Yerkes.
On the selection of men for tasks requiring special skill. Chairman; Dr. Thorndike.
On psychological problems of aviation, including the examination of aviators. Chairman; Dr. Burtt.
On psychological problems of incapacity, especially those of shock and re-education. Chairman; Dr. Franz.
On the psychological aspects of vocational advice and training. Chairman; Dr. Watson.
On recreation in the army and navy. Chairman; Dr. Coe.
On pedagogical and psychological problems of military training and discipline. Chairman; Dr. Judd.
On problems of motivation in connection with military service. Chairman; Dr. Scott.
On problems of emotional stability, fear, self-control, etc. Chairman; Dr. Woodworth.
On acoustic problems of military significance. Chairman; Dr. Seashore.
On visual problems of military significance. Chairman; Dr. Dodge.

At the time of writing this note (June 5th), reports of progress have been made by nearly all these committees, and it is already evident that contributions of decided value may be expected in more than one direction.

The committee on the psychological examination of recruits, whose work would be in many respects of especial interest to the readers of this JOURNAL, may be cited in illustration. This committee comprises Drs. Bingham, Goddard, Haines, Terman, Wells, Whipple, Yerkes. At the courteous invitation of the Committee on Provision for the Feeble-minded, the committee in question has been in session since May 28th at the Training School, Vineland, N. J. The end of the first fortnight will see completed a provisional schedule (including direction-sheets, forms, record blanks, etc.) for the application of ten selected mental tests by the group method. It is planned to put these to immediate trial with various groups of adults, then to reassemble the committee about July 1st for further revision of the material, determination of methods of scoring, etc.

In addition to these ten group tests, which it is proposed to apply to every recruit in the concentration camps, the committee is also working out a program for individual tests that can be applied to all cases where more careful examination is indicated.

It should be explained that the work thus far represents directly or indirectly the voluntary activity of the American Psychological Association, and that the final acceptance or rejection of the program of mental examination of recruits is a matter for future decision by the military authorities at Washington. In any event, the desire of the psychologists is to work under the direction of the medical or other military authorities who control the disposition of recruits and to employ the methods of mental tests to secure information that may enable the proper authorities to proceed more precisely and intelligently in the selection of men for various kinds of military activity.

In this connection it may not be out of place to correct the impression that seems already to be current in some quarters that the idea of psychologists is to eliminate all imbeciles, morons, and individuals of low-grade intelligence generally from the army. On the contrary, there may be many situations in which these persons may perform useful service. What is necessary, however, is to know who these men are and what their limitations are.

There should also be reported here a resolution passed unanimously by the General Committee on Psychology of the National Research Council to the effect that psychologists, like other men of science, ought to consider seriously before enlisting in the regular line of the army, whether their familiarity with the methods of their science might not enable them to render more effective service to their country in some other direction. It is evident, for example, that the acceptance by the government of the plans just outlined for the mental examination of recruits will demand within a very few weeks the commissioning as scientific experts of one hundred or more specialists in psychology.

G. M. WHIPPLE

NOTES AND NEWS

The State of Iowa is to have the credit of establishing the first Child Welfare Research Station. The recent act of the legislature authorizing the appropriation of $25,000 a year for this purpose inaugurates an attempt to do for human life what animal husbandry experiment stations have long done for the conservation of animal life. The work of the station includes six divisions, as follows: I. Heredity and prenatal care, focussing the resources of the rapidly growing science of genetics upon the problems of parenthood in Iowa; II. Nutrition of the child, investigating and combatting the causes of infant mortality in the state; III. Preventive medicine, including the study of infant diseases, preventive dentistry, hygiene of the nervous system, and the establishment of standards of normal development for Iowa conditions; IV. Social surveys, giving a basis for legislation on birth registration, sanitary codes, industrial regulation, and school attendance; V. Education and morals, with especial attention to the types of education that may be utilized by parents before the children are six years old; VI. Applied psychology, involving studies in mental health and growth. There is undoubtedly a splendid field for research in each one of these divisions, and the State of Iowa is to be congratulated on engaging in such a beneficent and far-reaching enterprise.

Under the direction of Dean C. E. Seashore, of the University of Iowa, surveys of musical talent have been made in the seventh and eighth grades of the public schools of Sioux City and Charles City, Iowa. As a result, seventy children have been encouraged to study music with the assurance that they possess native ability. Twenty-four of these had never had any special training in music. Since the development of latent resources is the highest form of wealth, and nothing can be compared with human resources, it is evident that such surveys promise to be a most valuable and productive feature of school activity.

The Bureau of Coöperative Research of the College of Education, University of Minnesota, has recently circulated a questionnaire to determine what modifications of educational practice have resulted from the application of educational measurements. The returns should make interesting reading. While it is undoubtedly true that educational measurements are of significance only in so far as they

furnish a basis for educational practice, a question may well be raised as to whether these measurements have been sufficiently developed and standardized to constitute an adequate foundation for educational procedure. The Courtis tests in arithmetic have been extensively used, but we know very little yet about what the results signify. Much more extended experimentation is necessary before educational measurements can furnish guides for teaching.

At a recent meeting of the Council of the American Psychological Association it was voted to authorize the organization of a committee of psychologists to coöperate with the National Research Council in connection with the war. Special investigations of problems connected with military affairs, such as the examination of recruits, re-education, shock, etc., will be undertaken, and the resources of psychological laboratories will be placed at the disposal of the Nation

The Southern Society for Philosophy and Psychology held its twelfth annual meeting on April 12 and 13, 1917, at Randolph Macon Woman's College, Lynchburg, Va. It was voted to extend the scope of the Society so as to include "experimental education," and to hold the next annual meeting at Peabody College for Teachers, Nashville, Tenn. The following officers were elected: President, Prof. E. K. Strong, Jr., Peabody College, Nashville; Vice-President, Dr. T. V. Moore, Catholic University of America, Washington, D. C.; and Secretary-Treasurer, Prof. W. H. Chase, University of North Carolina.

Professor H. W. Conn, of Wesleyan University, known for his work on bacteriology, biology and evolution, has died at the age of fifty-eight years. His recent book entitled "Social Heredity and Social Evolution" is of particular significance for the theory of education.

Dr. Abraham Flexner, whose ideas in regard to "The Modern School" have recently created such commotion in conservative educational circles, has resigned from the New York City Board of Education, pleading pressure of other duties. Dr. Flexner has recently been advanced to the secretaryship of the General Education Board.

Dr. Walter F. Dearborn has been advanced from an assistant professorship to a full professorship of education at Harvard University. Dr. Henry W. Holmes has also been made full professor of education at that institution.

Dr. Frank W. Ballou, director of educational investigation and measurement in the Boston public schools, has been elected assistant superintendent of schools in that city.